



GEORGIA DEPARTMENT OF AGRICULTURE
2013 Specialty Crop Block Grant Program
FINAL Performance Report
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1). Eastern Cantaloupe Growers Association – Providing Safe Production, Handling and Preparation Training for Cantaloupe Growers and Consumers - Final Performance Report

PROJECT SUMMARY

With increased focus on food safety issues following two major food borne illness outbreaks in cantaloupes, this project had three objectives to address industry needs of the cantaloupe industry. The primary objective was to educate growers on good agricultural practices in the production and handling of cantaloupes in the field and in packing facilities. The second objective of the project was to provide consumer education on safe handling and preparation of cantaloupes at home. The final objective of this grant was to address a critical research need to identify varieties with longer shelf life. As noted in the summary below, the research objective had to be changed (from the original project to establish water standards and an effective treatment/measurement matrix to reduce the incidence of cross contamination of pathogens in the packing facility).

According to the Centers for Disease Control (CDC), 23 food borne illness outbreaks identified to be cantaloupe related occurred between 1984 and 2002; 1434 people became ill, 42 were hospitalized, and 2 died in these outbreaks. These outbreaks included five serotypes of Salmonella enterica, Campylobacter jejuni, Escherichia coli O157:H7, and norovirus. However, by 2013 the cantaloupe industry had incurred more serious food safety issues with outbreaks of food borne disease associated with pathogens at Jansen Farms(CO), Burch Farms(NC) and Chamberlain Farms(IN).

Responding to public outcry, the FDA moved forward with implementation of the produce safety requirements of the Food Safety Modernization Act (FSMA). This was a sweeping new set of regulations with which all growers and shippers must comply. There was to be an implementation period during which growers must be educated and trained on the regulations and how they must conform to them.

In order to preserve the cantaloupe industry in Georgia and other southeastern states, it was critical that growers follow the national cantaloupe guidance and conform to the new FSMA regulations. This adherence to regulations will provide confidence to the consuming public that cantaloupes are safe to eat. This project provided funds to assist in this educational process with training workshops.

The cantaloupe's unique netted surface is a key element in the transfer of bacteria. Bacteria can reside under this netting and when a consumer cuts through the exterior rind, the bacteria can be spread. As part of this project, a 'safe handling and

preparation' video was developed and posted on web sites, and provided for distribution to various media outlets.

The final component of the project was to develop scientific guidelines to create a testing matrix for water use in the packing facility. In most cantaloupe packing facilities, water is used in an unloading flume to move the melons from the field trailers to the packing line to reduce bruising and exterior damage. Unfortunately, after further investigation, the funds appropriated to the research component was not sufficient to fulfill those research needs. In the third year of the project it was approved to change the research to a project that focused on varieties that had extended shelf life.

PROJECT APPROACH

The objective of this project was to help reinstate confidence in the eastern cantaloupe industry and in Georgia's industry, specifically, so it will survive and thrive going forward. The approach for this project focused on the following three activities:

- Hold a training workshop for growers to learn the procedures to follow National and regionally specific food safety guidance, in addition to FDA's guidelines.
- Develop and distribute a special YOU TUBE video that consumers can watch to learn more about cantaloupes including preparation, safe handling, and storage information.
- Conduct a research project to determine the varieties which have the longest shelf life but maintain proper firmness, taste and quality for the consumer.

GOALS and OUTCOMES ACHIEVED

The first goal of the project was to increase the knowledge and understanding of cantaloupe food safety procedures for farm and packing facilities by conducting a grower workshop. On March 3, 2014, participants met in Atlanta, Georgia for the ECGA Annual Conference including a day-long grower workshop (Attachment 1, *available upon request from GDA*). Speakers for the workshop included,

Ms. Bonnie Fernandez-Fenaroli, Center for Produce Safety, UC Davis
Dr. Cathy Webb, U of GA
Dr. Trevor Suslow, UC Davis
Dr. Michelle Danyluk, U of FL
Ms. Katie Odrobina, GFVGA Consultant, GA Fruit and Vegetable Assoc.

Pre and post surveys were given to participants to measure the knowledge of the attendees before and after attending the workshop. According to the pre-survey, 23 % of attendees rated their knowledge and understanding of food safety 'best practices' for cantaloupe production and distribution as excellent; this increased to 58% of attendees

following the workshop. The target for the workshop was to increase the knowledge of at least 80% of the attendees. According to the post survey, 100 % of the attendees stated that the information presented at the conference increased their knowledge of food safety best practices for cantaloupes.

The second goal was to increase consumer knowledge and understanding of food safety procedures for cantaloupes by creating a Youtube video. While there was no benchmark for the project, a target was established as 1,000 hits to view the video. ECGA produced a 1-minute video detailing safe handling methods for cantaloupes in the home for shoppers. After creating this video, ECGA released the video on Youtube, <https://youtu.be/Y1IQv-YY61M> publicizing it on the association's Facebook page and website, <http://www.ecga-usa.org/recipes.html>. We then created a Quick Response code (ATTACHMENT 2, QR Code on Recipe Card, *available upon request from GDA*) linking to the video and printed it on colorful post cards to be easily distributed.

ECGA distributed more than 1500 cards linking to this video. ECGA reached out to 9 different retailer supporters representing large organizations like Harris Teeter, Kroger, and Delhaize, encouraging them to place these helpful note cards in the produce aisle. Grower members of ECGA were also provided several packs of the cards. The growers passed the cards along directly to their brokers, or some inserted a card with each load of cantaloupes they sold.

Additionally, an ECGA staff member was a speaker at the Association of Food and Drug Officials of the Southern States Conference in September and discussed the innovative steps ECGA Certified grower-members are taking to ensure safe cantaloupes in the market place. The 'safe handling' video was shown at the end of the presentation to more than 150 retail and regulatory officials, including representatives from Publix and several state and county public health departments.

Since this was a first time project, no baseline was set. However, since the video's release in May of 2014, we know it has received more than 500 views, although true exposure is difficult to estimate. The video was shared on various industry outlets, including the Georgia Department of Agriculture's Facebook page. While the target was a 1000 views, the 'Safe Handling' video will continue to be used on the ECGA web site, YouTube and in consumer presentations to educate consumers of safe handling procedures for cantaloupes in the home.

The third goal of the project was to provide growers with variety trail information. Unlike many vegetable crops, just one variety, Athena, contributes more than 95% of the planted acres of cantaloupes in Georgia. While this variety has been a consistently

strong producer for growers, it has a fairly short shelf life. Varieties with significantly improved storage qualities could improve the profitability of this crop for Georgia farmers. This research will help growers make decisions as to if the new LSL (Longer Shelf Life) varieties can meet their yield needs as well as maintain good taste, firmness and shelf quality standards. The full research report can be found as ATTACHMENT 3 – Variety Trial RESEARCH (*available from GDA upon request*).

The highest numerical yielding variety was USAMR14836, a long shelf-life melon from US Agriseeds. This variety was harvested later in the trial (Table 4 in Attachment, *available from GDA upon request*), with most fruit harvested 93 days and later after transplanting. This variety was not significantly different from 6 other varieties in terms of total yield. This variety was also the firmest melon trialed. ‘Athena’, the industry standard for Eastern melons, was the highest yielding Eastern type in the trial and the second highest yielding melon overall.

Sugars and firmness were highest in LSL types, harvested late in the trial. Many of the Eastern types had low sugars due to a rain event on 5 June that reduced brix readings in harvests taken at 81-85 days (peak harvest for these types of melons). The LSL types, harvested later in the season, had significantly higher sugar ratings than the Eastern types.

Outward appearance of cantaloupes was good for the first 5 days after harvest. On day 5 it was observed that the interior of ‘Aphrodite’ became watery and seed cavity loose. Aphrodite began to show unmarketable characteristics on day 7, while other varieties took longer. By day 12, no ‘Aphrodite’ melons were marketable. The two numbered varieties were firmer, had more intact seed cavities and displayed fewer unmarketable fruit than either ‘Athena’ or ‘Aphrodite’. ‘Athena’ showed a slight decrease in firmness over time.

BENEFICIARIES

The primary beneficiaries of this project are the approximately 250 specialty crop farmers in Georgia who are growing cantaloupes. In 2014, these growers planted more than 3,100 acres of cantaloupes with a farm gate value of \$19.8 million. A second set of beneficiaries were the consumers who learned the proper and safe handling techniques for cantaloupes.

LESSONS LEARNED

There were several lessons learned as a part of this project:

1. Unfortunately, there were more parameters to the original research project to establish a water matrix than first realized, so the project had to be changed to a variety trial instead.
2. We found that the recipe cards were not as recognized in the grocery store as we anticipated. Many times the retailer placed the card in an area away from the cantaloupe display and the card would have been better with a picture of cantaloupe on it. However, the cards were used and distributed in many venues.

CONTACT PERSON

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ADDITIONAL INFORMATION

Attached are three ATTACHMENTS (*available upon request from GDA*) that provide background information on the educational summit, the QR code project, and a full report on the variety trials.

2). Georgia Watermelon Association - Increasing Watermelon Industry Food Safety Awareness through Education for Growers and Consumers - Final Performance Report

PROJECT SUMMARY

Watermelon crops generated \$102 million of revenue at the farm gate in 2012 for the state of Georgia. Additionally, the byproducts of the crop (fertilizer sales, equipment sales, fuel, maintenance, etc.), add considerably to the state's overall economic foundation.

The purpose of this project was to educate both the general public and watermelon growers/shippers of safe production and handling procedures for watermelons. During the period of this grant (10/2013 – 9/2016), the watermelon industry, as well as the entire produce industry, has been in the midst of understanding and implementing the new regulations established by the Food Safety Modernization Act of 2011 (FSMA). Viewed as Washington's most significant overhaul of the Federal Food, Drug, and Cosmetic Act since 1938, FSMA is both precise and far-reaching.

This grant educated growers on the need for good food safety practices as required under FSMA for producing, harvesting, packing and shipping watermelons. Often, when new

regulations are issued, there can be confusion and uncertainty. This project educated growers on the specific procedures that are required to be in compliance with the new law.

Under this grant, the Georgia Watermelon Association, Inc. (GWA) also developed a QR code and YOU TUBE video to educate consumers on the proper handling procedures of watermelons at home. In it, consumers are informed of the importance of following safe handling procedures.

PROJECT APPROACH

The objective of this project was to ensure that consumers purchase and/or are served a Georgia Grown watermelon that is safe from any food borne pathogens or bacteria. Additionally, this project was developed to result in more watermelons being sold to consumers and food service outlets during June and July of 2014/2015.

The approach to ensure this project was successful included these activities and venues:

- In-store educational demonstrations highlighting safe handling and preparation techniques.
- Media appearances with a focus on similar food safety information
- Development and distribution of a special QR Code that consumers could scan in order to learn more about watermelons including safe handling, recipes, storage information and the nutritional value of watermelons.
- Training workshops for growers to learn the procedures to follow under FSMA.

GOALS and OUTCOMES ACHIEVED

The two GOALS and OUTCOMES achieved for this project are outlined below.

GOAL #1 – To Increase the Watermelon Knowledge of Consumers by using QR Codes

The first goal for GWA under this 2013 SCBG was to increase consumer knowledge of watermelon using QR codes. While there was no benchmark for the project, a target was established of 500 scans of the QR code or views of the video during and after in-store demonstrations.

As outlined in the proposal, the GWA Communications Coordinator worked with an outside developer to create the video and QR code. The coordinator found it to be cost effective to work directly with a turnkey video production company to create this educational tool for watermelons. With GWA's guidance and supervision, this production company created a 1-minute video (<http://www.youtube.com/watch?v=lav-IOsuFO8>) detailing safe handling methods for watermelons in the home for shoppers. After creating this video, GWA released the video on YouTube, publicizing it on the Association's Facebook page and

website. We then created a Quick Response code (ATTACHMENT 1, *available upon request from GDA*) linking to the video and printed it on colorful post cards to be easily distributed. The cards included copy indicating that the shopper could scan it for more recipes. There were links to fun watermelon recipes on the landing page for the card.

In order to make the public aware of these safe handling tips, these cards were distributed by GWA's public relations ambassador in festival locations, grocery store presentations and showcase events. ATTACHMENT 2 (*available upon request from GDA*) lists all of the 26 retail locations and 13 media presentations from which over 1,000 of the cards were distributed.

Since this was a first-time project, no baseline was set. However, since the video's release in May of 2014, we know it has received more than 350 views, although true exposure is difficult to estimate, as the video was shared on various industry outlets, including the Georgia Department of Agriculture's Facebook page. The target was 500 views. Because of GDA's wide reach, we are confident that at least 150 more views were gained from this source.

GOAL #2 – Increase the knowledge and understanding of watermelon food safety procedures required for farm and packing facilities to comply with the new Food Safety Modernization Act (FSMA) regulations.

Due to the delay in the release of the new FSMA regulations, this workshop was postponed until 2016. In January of 2016, two workshops were scheduled to help growers learn more about the new FSMA rules and requirements for their farms (ATTACHMENT 3, *available upon request from GDA*).

The first workshop took place in St. Simons Island in conjunction with the Georgia Watermelon Association's Annual Meeting. There were approximately 30 growers in attendance, and pre and post tests revealed that 100% of attendees saw an increase in their knowledge of FSMA rules and regulations.

PRE-WEBINAR:	
Please rank your knowledge of FSMA Rules – Produce Safety and Preventative Controls using the scale below.	
No knowledge	25%
Little Knowledge	30%

Some Knowledge	40%
Knowledgeable	5%
Very Knowledgeable	0
POST-WEBINAR: Please rank your knowledge of FSMA Rules – Produce Safety and Preventative Controls using the scale below.	
No knowledge	0
Little Knowledge	13%
Some Knowledge	20%
Knowledgeable	32%
Very Knowledgeable	35%

Using a numerical ranking of 1 = No knowledge and 5 = very knowledgeable, the pre-workshop score was 2.3. The post-workshop numerical score was 3.8, a 65% increase in grower knowledge from the workshop.

The GWA hosted the second FSMA workshop in Tifton in early September. There were 18 people in attendance.

PRE-WEBINAR: Please rank your knowledge of FSMA Rules – Produce Safety and Preventative Controls using the scale below.	
No knowledge	13%
Little Knowledge	50%
Some Knowledge	12%
Knowledgeable	25%
Very Knowledgeable	0

POST-WEBINAR: Please rank your knowledge of FSMA Rules – Produce Safety and Preventative Controls using the scale below.	
No knowledge	0
Little Knowledge	22%
Some Knowledge	12%
Knowledgeable	33%
Very Knowledgeable	33%

In pre and post tests for the workshop, *100% of attendees indicated an increase in their knowledge of FSMA rules and regulations.* Again, using a numerical ranking of 1 = No knowledge and 5 = very knowledgeable the pre-workshop score was 2.4. The post-workshop numerical score was 3.8, a 58% increase in grower knowledge from the workshop.

BENEFICIARIES

The beneficiaries of this project were the thousands of growers and consumers that have more education, training, communication and management tools that were presented as a part of this project.

LESSONS LEARNED

Throughout numerous in-store presentation in the 2015 and 2016 years, we found that the card was simply not engaging enough to generate interest in the QR code. We focused on trying to promote the video on Facebook and on our website, but overall views saw only a marginal increase.

Moving forward, while this method of information sharing is valuable and timely for consumer food safety practices, we see that QR codes are simply not as relevant as they have been in the past for generating overall exposure.

CONTACT PERSON

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ADDITIONAL INFORMATION

Attached are three ATTACHMENTS (*available upon request from GDA*) that provide background information, on the QR code card, the in-store presentations and media appearances and information on the two FSMA workshops.

3). Georgia Fruit & Veg. Growers Assoc. (PMA)- Increasing the Wholesale Market Share of Fresh Fruits and Vegetables for Georgia Growers - Final Performance Report

Project Summary

Over 90% of Georgia's specialty crop fruit and vegetable production, more than a billion dollars in farm gate value, is marketed and distributed for the fresh market (versus processing or value added contracts). This project focused on using the largest trade show in North America, the Produce Marketing Association's FRESH SUMMIT (PMA), to help expand the marketing of Georgia produce. Due to the activities covered under this project, it also increased the competitiveness of Georgia's specialty crop producers by reaching out to retail chain buyers and food service distribution companies. This project allowed Georgia specialty crop growers to continue to bring awareness to and re-establish relationships with retailer chain buyers that had been contacted at PMA show booths funded by previous SCBGP grants.

Project Approach

The Produce Marketing Association's 2013 FRESH SUMMIT was held in New Orleans, Louisiana, on October 19-20, 2013. This is the world's largest and most valuable fresh fruit and vegetable event. FRESH SUMMIT has an annual attendance of over 20,000 people from 50 countries annually. The Georgia pavilion had 4,700 sq. ft. of floor space and 19 exhibiting firms (see ATTACHMENT 1 for photos/layout, *available from GDA upon request*).

In 2013, the show was reduced from three days to two days, but it still brought together produce industry leaders to see new products, strengthen relationships with current suppliers, and gather information for future purchasing decisions.

Types of companies and commodities represented in the pavilion included: Farms, Growers, Shippers, Processors, etc. of Vidalia Onions, mixed vegetables (pepper, squash, cucumber, etc.), watermelon, tomato, blueberry, peach, muscadine, greens, cabbage, sweet potatoes, pecan, etc.

This project did not benefit any non-specialty crop commodity.

Goals and Outcomes Achieved

The goal of the project was achieved by giving Georgia producers a tremendous opportunity to market products and identify new outlets for their produce with buyers and procurement

departments from national retail grocery and food service organizations. Companies exhibiting in the pavilion were asked to report new customer leads and increased sales. Based on the information reported, the companies that exhibited in the Georgia Grown pavilion for the 2013 PMA proved the project to be very successful.

Performance Measurement:	TARGET	2013 PMA	REACHED TARGET/GOAL
New/Renewed Contacts:	3.0/exhibitor	3.4/exhibitor	Exceeded Target Goal
Increased Sales:	\$2 million	\$2.2 million	Exceeded Target Goal

The project had a goal of each exhibitor averaging 3 new or renewed contacts and the total pavilion increasing 2014 sales by \$2.0 million dollars. As noted above, the GA GROWN pavilion was successful in exceeding these two goals.

Beneficiaries

The beneficiaries of this project were not only the Georgia specialty crop producers that exhibited at the 2013 PMA in New Orleans and, on average, secured 3.4 new leads during the two day show. But even those growers who did not display also received marketing benefits as the GA GROWN logo was broadly promoted to the 20,000+ attendees.

Lessons Learned

There were several lessons learned and positive outcomes achieved:

1. PMA, *Fresh Summit*, continues to be the premier United States trade show to pair grower/distributors with retail and food service buyers. There is no other venue that Georgia specialty crop growers can utilize to reach this many potential new customers.
2. Despite initial fears, changing from a three-day to a two-day event did not hurt PMA Fresh Summit attendance or impact the value of the trade show to the attendees.
3. Unfortunately, there were unspent funds remaining in the project budget and we should have written a new proposal to use them. We did not have enough time to make an application revision for a new project to use those remaining funds. In the future we will submit for a new project if excess funds remain.

Contact person

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Additional Information

There are several photos included with this report that serve as reference material for the information presented, see ATTACHMENT #1 (*available upon request from GDA*).

4). Georgia Fruit & Veg. Growers Assoc. (Education) - Maximizing Educational Resources to Increase Productivity for Southeastern Specialty Crop Producers through Improved Availability of Risk Management Information- Final Performance Report

PROJECT SUMMARY

In Georgia, fruit and vegetable production is valued at more than \$1 billion at the farm gate. Southeastern growers are continually searching for information on changing marketing opportunities, new production practices in fruit and vegetable farming, the impact of compliance with changing governmental regulations, food safety standards and practices and the diverse strategies needed to mitigate risk. In this quest for increased cost competitiveness and confidence of a safe food supply, this project provided both grower and consumer access to the latest educational resources.

As the specialty crop industry in Georgia grows and expands, growers must use the latest in equipment, technology and risk management information. This project benefited and built on the accomplishments of past projects. For example, the 2011 grant provided for three food safety training workshops and one-on-one farm consulting so growers (55 farms) could move from the traditional GAP audit into the GFS (Global Food Safety) protocol. In addition, a monthly e-communication, THE UPDDATE, was implemented and it continues today. And more than 2,000 growers and industry suppliers attended the Southeast Regional Fruit and Vegetable Conference, with more than 84% acknowledging the information and materials they received as good or excellent.

The 2012 grant provided additional food safety training and on-farm consultation to ensure 10 more farms were certified with the GFSI standard for a total of 65 farms. The Southeast Regional Conference provided and presented new information to over 2,900 growers and special crop suppliers on weather, blackberry varieties, 2-4-D herbicide concerns, new 'integrated pest management alternatives' and many other key research topics, with 94.6% of attendees ranking the material and information received as good or excellent. And the GFVGA web site became a location of 'news and issues' for growers to stay updated on the latest information.

The 2013 grant built and expanded on past projects. But this project provided growers with the most current research and production information via conferences, webinars, publications and consultations. This project continued the farm-to-school educational programming and expanded the knowledge of locally grown food in connection with USDA's *Know Your Farmer, Know Your Food*. This project also ensured that GFVGA electronic publications were smartphone adaptable, since 87% of users check their email and the Internet with their iPhones.

New research, production techniques, food safety testing procedures and marketing opportunities were developed and improved. New products and processes introduced and utilized in 2012 or 2013 were updated in 2014, and this project provided growers and consumers the resources to find and understand these updates.

PROJECT APPROACH

The approach for this GFVGA block grant project was to deliver the services via a number of educational programs, conferences and venues as outlined below:

1. To enhance the competitiveness of specialty crop producers, these venues were successfully developed and implemented:
 - Southeast Regional Fruit and Vegetable Conference
 - Educational recordings/webinars
 - On farm food safety consultations
 - Internet programming (web site, DVDs, mobile apps, etc.)
 - Plus all 'online' information was developed so it can be accessed from smartphones or computers.
2. To develop outreach opportunities, resources and other mobile friendly information to increase educational programming for both students and consumers: These programs supported the popularity of 'locally grown' and USDA's 'Know Your Farmer, Know Your Food' focus, and directed students and consumers to robust websites that were smartphone friendly and featured Georgia Grown specialty crop products.

GOALS AND OUTCOMES ACHIEVED

Southeast Regional Fruit and Vegetable Conference

The SE Regional Fruit and Vegetable Conference was held on January 9-12, 2014 in Savannah, Georgia, with more than 3,000 people in attendance. This was a 3.2% increase in attendance over the 2013 Conference. The Conference had over 92 hours of educational sessions available to the attendees (see ATTACHMENT 1, Education Program, *Available upon request from GDA*), and 92.5% of the attendees rated the cost of the Conference to the value they received as good or excellent. In addition, 94.4% of the attendees said the time they spent at the Conference was good or excellent when compared to the value of the education they received.

The measurable outcome for the 2014 Conference was to continue to meet or increase the positive responses of attendees regarding the value of their attendance and the quality of education. The surveys conducted after the Conference showed 90.2% (91.1% in 2013) of the

attendees rated the usefulness of information from the educational sessions as good or excellent. In addition, 84.7% (89.2% in 2013) of the attendees said their knowledge of specialty crop production practices and/or management techniques increased. While approximately 85% of the attendees indicated an increase in their knowledge of specialty crop practices and/or management techniques, this number is 4.5% under the goal.

Performance Measurement:

Conference Yrs.

<u>2013</u>	<u>2014</u>	<u>+ - REACHED TARGET/GOAL</u>	
Attendance	2,912	3,005	+ -exceeded goal by +3.2 %
Cost to Value rating	94.8%	92.5%	+ -under goal by 2.3%
Value to Time	94.8%	94.4%	+ -maintained goal

<u>2013</u>	<u>TARGET</u>	<u>2014</u>	<u>+ -REACHED TARGET/GOAL</u>	
Usefulness of classes	91.1%	91.0%	90.2%	- under goal by less than 1%
Gained knowledge	89.2%	89.0%	84.7%	- under goal by 4.5%

SE Regional DVD-ROM Recordings:

The educational sessions at the 2014 SE Regional Fruit and Vegetable Conference were recorded and a DVD of all of the sessions was made available for both those attending and those not attending. There were 104 farms/companies that took advantage of the full conference recording offering. This was an increase of 41 farms/ companies that took advantage of this educational opportunity in 2014.

Growers were surveyed to determine how they used the DVDs which they received with Conference information.

- 77% of the individuals responding to the survey that received a DVD personally watched portions of the conference proceedings.

- 92% of the growers responding that received the DVD showed parts of the DVD to others at their farm or operation. On average 4 additional workers viewed parts of the DVD.
- 92% of the growers responding that received a DVD said it was helpful.

Performance Measurement:

BLOCK GRANT YEAR

	<u>2013</u>	<u>TARGET</u>	<u>2014</u>	<u>+ - REACHED TARGET/GOAL</u>
Growers requesting DVD	65	69	104	+ exceeded goal (target – increase by 5%)
Avg # watching DVD/farm	4	4.2	3.98	- maintained close goal level (target – increase by 5%)
% of growers saying helpful	86%	90%	92%	- exceeded goal (target – increase by 5%)

On Farm Consultation for Food Safety:

Through this project, GFVGA provided several types of consultation: GFSI, Georgia GAP, Farm to School guidelines and basic consulting for growers just starting a food safety plan. With the implementation of the Food Safety Modernization Act (FSMA), understanding and implementing food safety programs are going to become even more critical.

As of 9/30/2014, the GFVGA's Georgia GAP Food Safety Program provided consultation to 75 farms. In addition, the program worked with 12 clients that had no food safety plan in place.

Performance Measurement:

BLOCK GRANT YEAR

	<u>2013</u>	<u>Benchmark</u>	<u>2014</u>	<u>+ -REACHED TARGET</u>
Certified Operations	65	75	75	+ - Reached goal
Consult with farms with				
no food safety plan	n/a	5	12	+ - Exceeded goal

In addition, GFVGA consultants provided 118 mock audits of blueberry farm operations during the spring and summer of 2014.

Educational Programs/WEBINARS

GFVGA offered two webinars reviewing the Food Safety Modernization Act (FSMA) rules for Produce Safety (PSR) and Preventive Controls for Human Foods (PCR). Both webinars were recorded. GFVGA staff located and developed two tools to help producers under their obligations to these rules and areas to help further explain the regulations. All attendees received the recordings of both webinars, a PDF of the PowerPoint presentations, a resource guide for each rule, as well as a decision tree to help determine if and to what extent their operation may be subject. All these can be found in the ATTACHMENT 2 (*available from GDA upon request*) with links.

The GOALS were met to locate or develop training tools for on-farm training of FSMA requirements, specifically the Produce Rule and Preventative Controls Rule. Two food safety webinars were provided at no cost to the entire Georgia produce industry and to out of state growers, to help growers further understand FSMA. The pre- and post- webinar surveys show the PERFORMANCE MEASURE and TARGET were achieved as attendees preparedness for the rules increased over 25% (*more detail below*).

Produce Safety Rule Webinar

On September 9, 2016, Dr. Jim Gorny, Vice President of Food Safety & Technology for the Produce Marketing Association presented, “Legal Requirements of the Produce Safety Rule,” a one hour presentation on general FSMA regulations as well as specific requirements found in the Produce Safety Rule. This was followed by approximately thirty minutes of questions and discussion from the audience. Of the 84 people registered, 64 people attended the webinar with farming operations representing over 51% of attendees. Other attendees ranged from land grant extension and researchers to government regulators to retail and food service organizations. The attendee list represented 12 states, including Hawaii, as well as one farming operation from Nova Scotia.

The 64 attendees were asked a series of questions at registration to acquire their base line knowledge of the Produce Safety Rule and its operation.

Preventive Controls Rule Webinar

On September 16, 2016, Dr. David Gombas, retired Vice President of Food Safety & Technology for United Fresh Produce Association, presented, “A Deeper Dive into the Preventive Controls Rule in Produce Packing Facilities,” a one hour presentation on the specific requirements found

in the Preventive Controls Rule for Human Food. This was followed by approximately thirty minutes of questions and discussion from the audience.

Of the 67 people registered, 40 people were from farming operations, representing over 52% of attendees. Other attendees ranged from land grant extension personnel and researchers to government regulators to retail and food service organizations. The attendee list represented 10 states, including the District of Columbia. The 40 attendees were asked a series of questions at registration to acquire their base line knowledge of the Preventive Controls Rule and its operation.

There were two specific questions asked before and after this webinar to help measure specific knowledge that is often confusing to operators. We are pleased to show this webinar helped aid in dissolving some confusion with attendees.

For the Prevent Controls Rule Webinar, all attendees were given the opportunity to provide questions at the time of registration for the speaker and/or for areas for which they wanted more information. All questions were answered/addressed in the presentation or during the Q&A portion of the webinar. The majority of questions centered around wanting to know general information about the Preventive Controls Rule, changes, updates, compliance dates, etc. But other questions were very specific including:

- Clarification of off-farm facilities & secondary activities farm; "manufacturing/processing" of whole, uncut produce,
- Does the verbiage need to change in the HACCP plan to comply with PrimusGFS and FSMA requirements; how does my HACCP plan need to change, etc.,
- Does each State Ag Department have to do onsite inspections?
- What documentation is needed for supply chain control verification?
- How to we become a PCQI?
- Is a recirculated produce wash process required to be considered a preventive control? A CCP or only a CP? And why?
- Is environmental testing required?
- Is there a good, easy to understand decision-tree for determining whether an operation comes under PC or Produce Safety rules?
- What is Extension's role in working with growers concerning the Preventive Control Rules?

Grower and Consumer Communications via Internet:

Now more than ever before, one of the most important needs for a specialty crop grower is TIMELY INFORMATION. In 2011, GFVGA established a monthly e-newsletter called *The Update* with the assistance of specialty crop block grant funds. In the three years since its beginning, evaluations have shown *The Update* to be an effective communication tool across all

demographics of specialty crop growers and industry members. In the year covering October 1, 2013- September 30, 2014, *The Update* average readership was 26.5 percent (up 2½ points from 2013), showing that this publication surpasses the industry standard for similar nonprofit newsletters.

Additionally, according to the 2014 readership survey, more than 87% of survey participants find that *The Update* strengthened their knowledge of the fruit and vegetable industry in the southeast. (ATTACHMENT 3 – copy of *The Update*, available upon request from GDA). In addition, GFVGA was able to create a mobile site for the GFVGA website. (ATTACHMENT 4 – GFVGA Mobile Friendly Site, Available upon request from GDA).

The primary goal for this project was to establish GFVGA news outlets, website and Facebook as credible sources of information regarding the produce industry. The PERFORMANCE MEASURES for this included continuing the production of monthly newsletters, and driving readership traffic to both our website and specifically the ‘News and Issues’ section. GFVGA used Google Analytics to report specific traffic data on the website as well. In one PERFORMANCE MEASURE, GFVGA sought to increase the number of consumer searches using engines like Bing and Google that lead to the website. Due to advances in the worldwide web network, some of this data can no longer be accurately assessed (*further explanation below*).

BENCHMARKS and 2014 Reporting Data are listed below.

Other info:

<i>Performance Measure</i>	<i>Benchmark</i>	<i>Target</i>	Actual
# Unique Hits on GFVGA.org	15,000	17,000	19,252 unique sessions*
# Unique Hits on News/Issues	2,400	2,700	2,825 hits in news/issues
# of KEYWORD Searches	3,375(25% of total)	Inc. to 30%	**See below
# of Update Issues Smartphone friendly		12	12
# of participants/ Feed My School Program		25	estimated at 25 ***

*Session represents a time when a user is actively engaged in the website.

**GFVGA.org had 19,252 sessions from October 2013 to September of 2014. During that time, Google Analytics recorded that more than 12,000 of those sessions came from organic searches through engines like Google and Bing. As internet use and traffic has increased, security settings for a user’s search history have also increased. The result of this is that in some cases Google Analytics is unable to record what words were used during the search. Approximately

9,000 of the 12,000 searches mentioned earlier reported that the word was “not provided,” meaning the user was accessing this search from an SSL – or secure sockets layer. We recognize this by a URL that begins with “https://.” Because we are unable to see what a large majority of users typed in, we are unable to determine the number of consumers searches for this report.

*** On November 14, 2014, representatives from the Georgia Fruit & Vegetable Growers Association met with 20-25 School Nutrition Directors from Northeast Georgia to discuss best practices for serving fresh produce in schools, food safety standards and marketing the fresh fruits and vegetables to their student body. A short video was shown to showcase one commodity as a preview of the educational materials that the GFVGA is developing to help market Georgia Grown produce. These videos promote fruits and vegetables to students and teachers, and aid school nutritionists as they participate in Feed My School activities. The workshop ended with a short question and answer session. The goal was to identify tools that GFVGA can produce that would increase consumption and nutritional awareness of fresh fruits and vegetables to school children.

BENEFICIARIES

The beneficiaries of this project are the thousands of growers and consumers that had exposure to the education, training, communication and management tools that were presented as a part of this project. These tools will help growers to be more competitive and help consumers understand the value of Georgia’s specialty crops.

LESSONS LEARNED

The biggest lesson learned was that we can’t depend on regulatory deadlines to plan workshops. Due to the delays in announcing the FSMA guidelines, we were *almost* unable to complete the workshop/webinar section of the grant. Fortunately, those guidelines were released just early enough that we could schedule those educational venues.

CONTACT PERSON

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ADDITIONAL INFORMATION

Included with this document are 4 ATTACHMENTS (*available from GDA upon request*) that provide background information, supporting documents, handouts, photos, and other materials that were produced as a part of this grant.

5). Georgia Olive Growers Association - Education, Training and Solutions to Increase Competitiveness of Olive Production by Southeastern Producers -Final Performance Report

Project Summary

The Georgia Olive Growers Association (GOGA) with the aid of USDA through the 2013 SCBG Program made great strides forward in assisting the olive industry to grow in Georgia and the Southeastern United States. GOGA established an organized and analytical approach to address and determine the research needed to address important factors such as potential olive pests, disease, effects of humidity, rainfall and cold, and optimal varietal selection.

GOGA educated and informed existing growers, potential growers and investors with the results of our research. We established a framework for maximizing the marketable products that can be produced from olive trees in Georgia and the Southeast; thus increasing the competitiveness of this new Georgia grown product in the U.S. markets. We were successful in achieving all of our goals proposed for this project.

Project Approach

Through this project, GOGA;

- Presented, demonstrated and participated in five events;
- Organized and conducted the 2014 GOGA Annual Conference and Meeting with a record number of 172 attendees;
- Conducted olive orchard tours for over 1,400 people;
- Launched an information-filled website;
- Assisted in creating a research and development team at the University of Georgia;
- Worked with national support organizations on US education; and
- Promoted international label standards.

To accomplish these activities, GOGA staff dedicated over 1,400 hours to this project.

Goals and Outcomes Achieved

(1) Central Industry Information “Clearinghouse”

The goal was to develop a communications system for growers and producers in order to create better industry communication. To this end, we developed a new website for growers and producers in order to create better industry communication. We currently have 643 “Likes” on our Facebook page and received 1287 email and 621 phone calls for information pertaining to growing olives in the southeastern U.S. The website has had 34,420 page views and 6,592 users have visited the site since it went live in March 2014. These outcomes far exceed the 10% increase benchmark that was set for this project.

(2) Educating Olive Growers about Issues and Obstacles of Olive Oil Production

The goal was to increase the grower knowledge of production and cultural practices, orchard implementation, as well as to deliver new research, including climate and weather conditions as it related to orchard selection, cultural practices, and market findings. An Evaluation/Survey was completed by attendees at the 2013 GOGA Annual Conference and Meeting. They were questioned regarding their knowledge and opinions of the olive oil industry. From these surveys, GOGA's 2014 Scope of Work was developed and posted on the new website. The response on the Evaluation/Survey was an overwhelming 100 percent increase in knowledge.

A regional workshop was held in September 2014 to coincide with harvesting and milling. The purpose of the workshop was to provide current and potential olive producers across the southeast with pertinent information about production and cultural practices, orchard implementation, milling and harvesting, as well as to deliver new research and market findings as presented by the University of Georgia Research Institute and conducted as part of this project.

A farm tour at Georgia Olive Farms was given at the end of the day to introduce attendees to the new Georgia based commercial olive mill and harvesting techniques. The olive farm tour has become an important part of the education process. Staff has given tours to over 1400 people through both individual and group tours. Over half were given as education group tours (see attached 2013/2014 Group Tour list and Meeting and Events list: *available from GDA upon request*).

(3) Competitive Markets for Georgia Grown Olives and Olive Oil

Our goal was to increase consistent customers for olive oil produced in the southeast, both domestic and foreign. Even though the overall consumption of olive oil has grown steadily over the past two years, we determined that southeastern olive oil producers are not yet ready to expand, as they do not have the quantities to expand into the foreign oil or leaf market. In 2013/2014 the production of olives grew by more than 20% in Georgia as existing orchards (Terra Dolche and Georgia Olive Farms) grew in maturity. As awareness and marketing increased, the demand also increased and even exceeded the availability of Georgia produced olive oil. This caused producers to have a shortfall of product at the end of the year. Over 120 acres of new olive orchards were planted during this grant period. During the next few years, production will increase as these orchards begin to produce. Existing orchards will also mature, allowing producers to keep up with the growing demand.

(4) Multi-Discipline Research for Pest, Disease and Climate/Environmental Studies in Georgia Olive Production

Our goal was to determine existing and potential olive pests, diseases, and vector pressures, as well as gain an understanding of macro/micro climates and environmental effects on olive production and olive oil quality. The University of Georgia's Research Report was completed in September 2014 (see attached report, *available from GDA upon request*). Dr. Philip M. Brannen, Extension Plant Pathologist, presented and

answered questions about the report at the 2014 GOGA Conference/Workshop and a copy was given to each attendee. This report has been made available at all events, tradeshow and workshops where GOGA was an exhibitor or presenter. The report was also made available via GOGA's website and upon request via email.

Beneficiaries

This grant benefited approximately 15 commercial olive growers in Georgia and the Southeast and the members of GOGA by providing education, research, information dissemination, and marketing to help improve their competitiveness. It also benefited consumers through exposure and education.

Lessons Learned

Farm tours have become an important part of the education process for the olive industry for both consumers and potential growers. We see this increasing specialty crop, specifically olive production, awareness and agritourism in the state of Georgia. This is a vital tool for growth and should be continued.

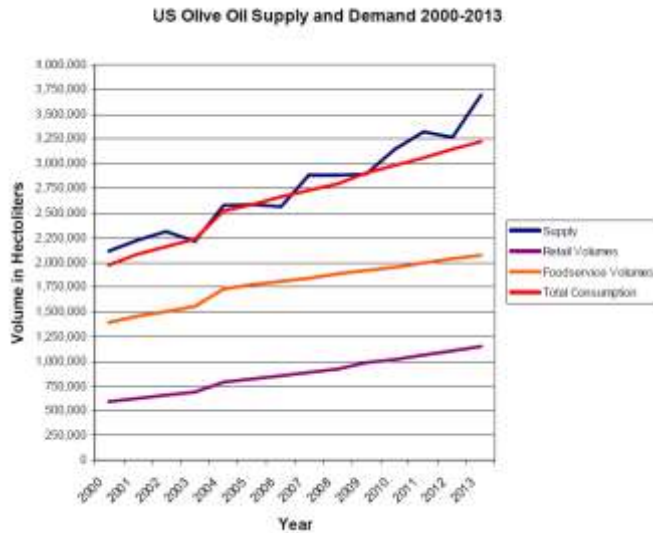
GOGA moved its Annual Conference/Workshop to the fall in order for attendees to see the new regional olive mill and harvester working. This event was a huge success. We have learned that harvest time is not the optimum time to hold our Annual Conference/Workshop due to logistic and liability issues; therefore, the event has been moved back to spring, which has worked well in the past.

Contact Person

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Additional Information

U.S. Olive Oil Domestic Consumption by Year:



Market Year	Domestic Consumption	Unit of Measure	Growth Rate
2012	294	(1000 MT)	-6.07 %
2013	316	(1000 MT)	7.48 %
2014	325	(1000 MT)	2.85 %

Attachment List *(available upon request from GDA)*

- 2013/2014 Meeting and Event List
- 2013/2014 Group Tour List
- UGA Olive Report

6). Georgia Peach Council - Sweet Georgia Peaches; Taste the Health Benefits - Final Performance Report

PROJECT SUMMARY

Our initiative for this project was centered on using a relatively new kind of resource: supermarket retail dietitians (SRDs) to help communicate not only our Sweet Georgia Peach message, but our healthy Georgia Peach message as well.

As the Georgia Peach Council traveled around from retailer to retailer promoting Sweet Georgia peaches, it became increasingly obvious that we have not done a good enough job explaining the health benefits of Georgia peaches. Childhood obesity is at historic highs: with this project, we decided we must collectively do a better job in reaching youths. According to Nutritiondata.com's Completeness Score, Georgia peaches ranked higher than blueberries, apples, pomegranates, bananas, pears, grapes (red and green) and watermelons when

measuring total nutritional balance. Georgia peaches are a healthy addition to a balanced diet of nutrients, vitamins and minerals.

PROJECT APPROACH

We have seen how the marketing of health benefits has increased the popularity of almonds, blueberries and pomegranates. Supermarkets have begun to employ SRDs to carry healthy messages to consumers. These SRDs are tasked to answer questions and provide assistance to consumers as they navigate food purchasing decisions in supermarkets. These same SRDs have been tasked to work with suppliers to develop educational programs, program materials and product demos.

Knowing that the SRDs have become experts in the minds of consumers, we went to this group of professionals and had them carry the appropriate message to customers: to eat more Sweet Georgia Peaches. Tools used to assist SRDs developed by the Georgia Peach Council include a dietitian tool kit, brimming with information that is easy for shoppers to use and understand, including fun nutritional facts and recipes as well as merchandising materials such as bin wraps and posters targeting shoppers at the point of purchase. Another goal was to make these materials available via the Georgia Peach Council website's retailer section, <http://gapeaches.org/retailers/>, to any small store that wanted to promote peaches and especially Georgia Peaches.

Included with this report is a copy of the tool kit that was created (see Attachment #1, *available upon request from GDA*), a list of retailer ads and comments from those who were promoting Georgia Peaches in-store during our peak promotion (see Attachment #2, *available upon request from GDA*), as well as social media posts that three retailers provided from the dietitian tool kit (see Attachment #3, *available upon request from GDA*). The kit was distributed to each of the retailers listed below. While we had great participation, we also discovered lead time for these materials for some groups needed to be well in advance of what we were offering. Large store retailers such as Hy Vee, Roundys and TOPS were excited that this valuable information was being offered. That said, their docket was full as far as dietitian materials slated for use during our peak promotional time.

GOAL AND OUTCOMES ACHIEVED

Have participating retailers/SRDs use the tool kit and convince consumers and their children of the benefits of feeding their children fresh fruit, specifically sweet Georgia peaches, as a healthy snacking alternative.

It was hard to determine if we reached our TARGET of at least 25 percent of the consumers purchasing peaches after hearing and seeing the demo and reading the information from the

tool kit. The PERFORMANCE MEASURE we were using requiring each SRD keeping records of how many consumers visited the demo table and how many of those actually purchased peaches after hearing the educational aspects of the demo, which was difficult to obtain. Therefore, we were not able to measure purchases directly related to the demo and/or the information from the tool kit.

WalMart could not share sales data related to peaches or lift after the demos, but they did indicate that they plan to do peach demos again next summer.

The metrics Kroger used to measure success are included (see Attachment #4, *available upon request from GDA*), and show a resounding increase in Georgia peach sales due to the samplings provided of sweet Georgia peaches. The overall participation was high with either the dietitian tool kit and/or promotional materials including bin warps.

In spite of not using all of the dietitian materials, each of the retailers below (and many others) participated in our campaign, which included the dietitian materials but also the point of sale materials educating shoppers at the point of purchase about sweet Georgia Peaches.

BENEFICIARIES

The retailers participating all benefited by utilizing the dietitian or POS materials, as did their customers, as the materials informed them of the healthful benefits of Georgia peaches. Ideally, shoppers will remember where they need to go when they seek out our peaches during the summer months.

Growers in Georgia also recognized a big benefit from this program: Growers, representing 90% of the state's peach production, reported record returns on a per box basis for the 2014 crop. While growers are not willing to share exact numbers, we estimate this increase to be well over \$3M in total, based upon those growers that we have received data from. This feat is a huge benefit to the industry in Georgia. Optimism among growers is high and most are again planting trees for the future.

LESSONS LEARNED

It is imperative to begin this section with emphasizing the ongoing success peach growers in Georgia continue to recognize due to cohesive marketing efforts managed by the Georgia Peach Council and partially funded through the Specialty Crop Block Grant program. Over the past five years, we have chartered into new territory as far as marketing Georgia's name sake specialty crop. The 2014 season was no different and again set a new high bar for grower returns.

The primary takeaway from the 2013 initiative was the value both consumers and retailers place on SRDs. If one were to ask what a supermarket dietitian was five years ago, blank stares would have been the standard response. Today, nearly every supermarket in the country has some sort of affiliation with supermarket retail dietitians. SRDs are viewed as cost conscious and trustworthy nutritionists in the eyes of consumers. The Georgia Peach Council will continue to capitalize on this hidden gem in the world of produce marketing.

With each season we try to reflect on areas of improvement. As mentioned above, we were not able to take full advantage of the SRD information due to timing. As we continue to include SRDs in our program, we will begin discussion of summer peach programs with some retailers as early as the fall. We will continue to build and improve on the resources we developed this year for years to come. The support of the SCBG initiative is genuinely appreciated by our growers.

CONTACT PERSON

Duke Lane III, Georgia Peach Council, 50 Lane Rd, Fort Valley, GA 31030

ADDITIONAL INFORMATION

Attachments available upon request from GDA

7). GA ACC-Pecans & GA Pecan Growers Association - Georgia Pecans: Building a Kid Friendly Healthy Future Project - Final Performance Report

Project Summary

Georgia leads the nation in pecan production -- accounting for one-third of all U.S. pecans in the market. However, at the time of this grant's submission, domestic consumption of U.S. pecans had decreased by 20% in a two-year time frame. Other tree nuts such as almonds, pistachios and walnuts were much more competitive to the American consumer in terms of product awareness, promotion, and even pricing. Additionally, peanuts (though not a tree nut) as a top Georgia commodity also provided significant competition for pecan suppliers in the state.

In order to promote Georgia pecans to account for a growing pecan supply amidst limited domestic demand, The Georgia Commodity Commission for Pecans (GACCP) partnered with *At The Table PR, Inc.*, a public relations firm, to design a campaign targeted at parents and their children to introduce the nut in a kid-friendly manner. GACCP was the original grant awardee and completed their activities in year 1 through contracted services with *At The Table PR, Inc.*, a

public relations firm. *At The Table PR, Inc.* submitted the activities in which they completed and were funded in year 1 for the first annual report and were then released from their contract with GACCP.

During year 2, no activities occurred and Georgia Pecan Growers Association (GPGA) submitted a request to amend the original grant in order for GPGA to undertake activities aligned with the original purpose of the grant. Effective in grant year 3 - the final year - GPGA developed, printed and distributed children's activity books focused on Georgia pecans and nutrition as part of the "Building a Kid Friendly Healthy Future." This grant thus became collaboration between The Georgia Commodity Commission for Pecans (GACCP) and the Georgia Pecan Growers Association (GPGA).

Project Approach

GACCP and *At The Table PR, Inc.* public relations firm designed the grant to achieve four objectives as follows:

1. Educate children and their parents about Georgia Pecans and their health benefits in the supermarket and classroom.
2. Increase involvement of students and educators in science and pecan industry
3. Increase potential study of pecan uses
4. Increase partnership and cooperation between pecan growers/shellers and grocery stores

Grant Year 1

In order to accomplish these objectives, *At The Table PR, Inc.* (*quoting directly from their first annual grant report*) launched "...an integrated marketing campaign that included social media, broadcast, website and print news with Publix Super Markets. Shelf cards were printed using the Georgia Pecans' logo and placed in almost 1,100 Publix stores in the southeast during the month of October [2013]."

"A press release was distributed nationally both by Produce for Kids and the Georgia Commodity Commission for Pecans. Circular ads for the Produce for Kids campaign were placed in Atlanta area markets as well as Miami and Lakeland, Florida markets."

Additionally, seven kid-friendly recipes were developed using Georgia pecans (Blueberry Banana Pancakes, Coco-Banana Overnight Oats, Nutty Apple Pancakes, Kielbasa Gnocchi & Nutty Green Beans, No-Bake Granola Bites, Peanut Butter-Drizzled Popcorn and Par-Stuffed Baked Apples) and listed on the website and social media for the Produce for Kids campaign led by *At The Table PR, Inc.*. The public relations firm continued multiple efforts during the month-

long (October 2013) campaign through social media avenues and a “Fall in Love with Georgia Pecans” Pinterest campaign.

The marketing campaign launched in the fall – to coordinate with Fall in Love with Georgia Pecans – led into a *At The Table PR, Inc.*’s spring time campaign, which was a “Pecans, Good for your Brain” and “Pecans in Science” campaign and contest. As they explained in their annual report, “Fliers were developed and either emailed and/or faxed numerous times between January 1 – February 28, 2014 to all schools in Georgia, the STEM coordinator, various county extension offices, the Georgia Department of Agriculture, the Georgia Farm Bureau, etc.”

Simultaneously to the above, in early 2014, the Georgia Pecan Commission focused all of their efforts through implantation by At The Table PR, Inc. on announcing the “Pecans, Good for Your Brain” Poster Contest for Georgia elementary schools and the “Pecans in Science” Experiment/Essay Contest for Georgia middle and high school students.

A press release was issued and distributed nationally about both contests. The press release itself was viewed 1,923 times and made headline impressions of 20,886. The release was posted on more 300 news sites with unique monthly visitors totaling over 275M.

Fliers were developed and either emailed and/or faxed numerous times between January 1 – February 28, 2014 to all schools in Georgia, the STEM Coordinator, various county extension offices, the Georgia Department of Agriculture, the Georgia Farm Bureau, etc. Contest rules were developed and a potential list of judges were contacted and confirmed. Russell Award winning pecan researcher, Dr. Ronald Pegg, was contacted and confirmed for student award and judging. Rules for the Facebook portion of the contest were developed. The award ceremony location was determined and secured. Revisions were made to the website in order to publicize both contests on the home page.

To increase awareness among high school students, the Georgia Pecan Commission exhibited at the 2014 Hospitality Expo on February 7, 2014, at the Georgia International Conference Center. We used signage and passed out fliers regarding the upcoming science experiment/essay contest to students who came by our booth.

➤ Year 1 (2013-14): Significant results

As reported by *At The Table PR, Inc.* in their first annual report for the Fall campaign, “Significant social media results were achieved through Publix/Produce for Kids social media channels. There were 157,000 impressions from Facebook posts; mentions to 10,690 Twitter followers; 9.75MM impressions in one hour; plus 1.3MM twitter accounts reached...; 3,722 Pinterest followers; and 715 Instagram followers...The social media and website audience far exceeded the 10% anticipated [reach].”

Publicity Results included media values of 2.2MM national outlets, 147,000 trade outlets and 2.8MM local outlets.

Blogger outreach impressions were 956,000.

An accurate advertising equivalency is often difficult especially when the results include online efforts, but according to ONLY a report from Produce for Kids on impact of this campaign, the total number of impressions were 2,889,198 with an advertising value of \$115,568.

At The Table PR, Inc. reported for the spring campaign, “The results from the poster contest included 24 elementary students from classrooms in Georgia. Ten winners were chosen. A press release was developed for each winner and sent to their local newspapers with a photograph of the student(s) holding their winning poster.”

“The reach through social media on Facebook peaked at 36,000+ as the poster contest was heating up. Trade media placements were mentioned in both the *Shelby Report* and *Sunbelt Foodservice* publications regarding contest winners.”

During the contest period, website results stated 27,469 page views with 69.1% coming from new visitors.

Due to the outreach by *At The Table PR, Inc.* to all schools in Georgia, plus the students in the schools of winning posters, this is one of the very first times students have heard about pecans being a brain food. We received over 4,500 votes which resulted in 10 winners of the poster contest! Although the posters were often submitted by one or two students, the poster design and voting often involved the entire class.

Further, *At The Table PR, Inc.* reported, “A survey of teachers and students was conducted about their knowledge of pecans before and after the poster contest. The resounding answer that was relayed was that any of the students and teachers who participated in this contest, without a doubt, learned and could recite the health benefits associated with the pecan. Ninety-five percent of the participants had an increased knowledge of pecans and their health attributes.”

Grant Year 2 During the second grant year, Oct. 1, 2014 through September 30, 2015, no grant activities were conducted by *At The Table PR, Inc.* or Georgia Pecan Growers Association. The Georgia Commodity Commission for Pecans (GACCP) served as the administrative oversight agency for this grant and allowed the contract with *At The Table PR, Inc.* to expire and was not renewed.

Grant Year 3 The Georgia Pecan Growers Association (GPGA) submitted an amendment to the original grant to the Georgia Department of Agriculture in order to continue the grant’s

objectives (after *At The Table PR, Inc.* and GACCP had essentially exited the project). GPGA's amendment was approved in March of 2016 and activities immediately began. GPGA used remaining grant funds specifically to achieve the grant's purpose, which was to promote healthy eating habits and good choices among children and their parents. In order to do this, GPGA used its existing children's activity book as a basis for further development and domestic distribution. GPGA uses an age-appropriate book for ages 9-12 that includes games and fun facts to teach children about the Georgia pecan and agricultural industry in Georgia. The book also includes healthy recipes suitable for kids to make and prepare themselves or with assistance from an adult. The purpose of the book is to promote the Georgia pecan using its nutritional value, versatility, and history to engage and interest children in making good food choices.

With grant monies from SCBG 2013, GPGA printed, shipped and distributed books both state-wide and at regional and national events in the U.S. to reach a broad audience beginning in April 2016 through the grant's closing date of September 30, 2016.

This GPGA amendment assisted in accomplishing two of the four objectives that were submitted in the original grant request as follows:

- 1) Educate children and their parents about Georgia Pecans and their health benefits in the supermarket and in the classroom (Note: Adjust "in the supermarket and in the classroom")
- 2) Increase involvement of students and educators in science and pecan industry

➤ Year 3 (2013-14): Significant results

The last shipment of activity books were sent at the end of September 2016, so GPGA is actually still in the process of evaluating the effectiveness. However, initial responses from those who received the books – including pecan suppliers, legislators, and consumers has been phenomenal! These books have provided a free and fun way for multiple stakeholders and pecan constituents to get Georgia pecan information to a new and young audience. GPGA has currently distributed all activity books which were earmarked for the 2013 Specialty Crop Block Grant, yet still continues to get requests for the books! It has been a very exciting and unique experience.

Goals and Outcomes Achieved

Years 1 and 2:

The original grant submitted by GACCP and designed by *At The Table PR, Inc.* public relations firm did not have much description in the way of quantifiable measurements with baseline data for their proposed activities although as described earlier in this report, their marketing campaign was significant in terms of numbers of people reached through social media outlets.

All activities were completed by GACCP/At The Table PR, Inc. in year 1, as stated previously, with no activities in year 2.

Year 3:

GPGA set a goal to distribute 35,000 activity books before the grant ended. We did succeed in accomplishing that goal and are evaluating the results currently. Anecdotal responses and requests for more books strongly suggest our portion of the grant's goals were achieved.

Beneficiaries

The stated beneficiaries of this grant were continually emphasized as children and their parents in order to influence the next generation of consumers and to present healthy food alternatives through pecans and pecan recipes. Of course, the pecan industry has reason to benefit, in that the activities highlighted Georgia Pecans nationwide.

Lessons Learned

Although the majority of components were still accomplished and completed for the Produce for Kids fall campaign, the overall result was disappointing due to no increased positioning or lack of better positioning of Georgia Pecans in the produce departments; hence, sales were not impacted by the campaign. In addition, due to circumstances out of our control, the POS displays were changed from a pyramid-style stand alone in the produce department to shelf cards. This change combined with the supermarkets/retailers decision to not move pecans to a more prominent position in the produce department made the necessity for surveys unattainable.

After publicizing Pecans in Science Experiment/Essay contest through media outlets, faxing (1,800 fax numbers x 2-3 times during a 2 month time frame), emailing, numerous postings on the website and social media channels, no entries were received; therefore, the decision was made to cancel the contest. Upon a lengthy conversation with the Georgia Department of Education's STEM Coordinator, it was recommended that if any other attempts were to be made that students and teachers need to be contacted a year in advance in order to ensure increased participation.

One of the challenges that occurred very early on was during the contest period, the entries came to halt due to severe weather storm in Georgia, that impacted and closed schools for nearly two weeks in March. However, due to the flexibility of schedules we were able to extend the contest end date and continue to promote to schools and through social media.

For GPGA, our efforts at distributing children's activity books provided some immediate positive feedback that free, fun and enlightening information for kids concerning Georgia agriculture is

extremely needed and appreciated by both consumers and producers. (As a side note, this appreciation becomes evident when viewed against the enormous activity of Young Farmers' group and Future Farmers of America (FFA) organizations that have such a stronghold in Georgia with high school and college-aged students. Reaching kids in the 9-12 age range, as our books were designed to do, feeds into this continued growth of future agriculturalists.)

GPGA feels that our amendment and activity did have a positive impact on the grant and will continue to collect feedback on the books that were distributed over the last 6 months.

Contact Person

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Additional information

For activities in year 1, GACCP and At The Table PR, Inc. expended \$107,100. As noted, no activities were held in year 2.

During the last 6 months of grant year 3, when GPGA was added by amendment, GPGA requested reimbursements totaling \$17,208.05, which covered development, printing and shipping of 35,000 children's activity books. These books are 12 pages long and appropriate for ages 9-12.

8). GA Dept. of Agriculture -Georgia Grown – Final Performance Report

Project Summary

The Georgia Department of Agriculture launched the "Georgia Grown" program in January 2012 for the purpose of aiding specialty crop producers in the marketing of their products. One of the greatest challenges in marketing local specialty crops is the inability of the consumer to differentiate between a local product and a generic product. Furthermore, consumers often do not know how or where to buy local specialty crops directly from the producer. The Georgia Grown program assists farmers by providing them with marketing materials for their specialty crops, identifying locally grown products at the point of sale, and educating consumers on how and where to purchase locally grown specialty crops. This is the third phase of this program and was designed to increase consumer awareness of specialty crops and where to buy them. This program accomplished this goal through three activities, market research, creation

of an agritourism guide, and implementation of an in-store signage program. This program also intended to create specialty crop foodservice website, but that was not accomplished.

Project Approach

This phase of the Georgia Grown promotion included a strategic approach to promoting locally grown specialty crops. The results of previous phases and previous market research helped identify the action items we wanted to accomplish. Promotion of non-specialty crops was closely monitored throughout these steps. Promotion of non-specialty crops in these projects was negligible or incidental. Below is an outline of our project steps.

Market Research – Our initial market research for this grant began in November 2014. The Georgia Department of Agriculture has partnered with the University of Georgia Center for Agribusiness and Economic Development to perform several market research studies at grocery stores and surveys of Georgia consumers to determine the consumer awareness and demand for specialty crops. Reports were completed in September of 2015 and September of 2016. This research found that:

- Overall, 73% of respondents think that “State of origin brand” matters when purchasing specialty crop food products. 81% of respondents think it matters that it is “Made in Georgia”.
Among them, 37% of respondents think it “matters a lot”, and 44% think it “matters somewhat”.
- 65% of respondents purchased Georgia Grown specialty crop food products at least once. Moreover, if price and quality are equal, 95% prefer having a Georgia Grown specialty crop product over a product that doesn’t come from Georgia.
- 44% recalled seeing some advertising or promotional materials for Georgia Grown Specialty crops. TV ads (52% out of 214) and displays (51%) were the main sources whereas newspapers (21%), brochures (20%), radio (11%), and internet (9.5% out of 484) had the lowest impact.
 - Among respondents who answered the ads and promotional tools questions (16% out of 484), 80% said they had an influence on purchasing Georgia Grown specialty crop products. In addition, 84% said that they regularly purchase Georgia Grown products since seeing these materials.
- Concerning the price, 78% of respondents were willing to pay more for a specialty crop with a Georgia Grown label: 42% are willing to pay up to 2% more and 36% are willing to pay an additional 5% or more.
- According to specialty crop farmers and processors: 67% said use of the Georgia Grown logo made a difference in terms of customers’ interest in their products, 51% said the promotion improved the publicity/exposure of their business.

More specifically in terms of distribution channels, the promotion helped reaching customers at retail stores (69% and farmers markets(52%)

- Finally, 96% of respondents are likely to purchase a specialty crop product with a Georgia Grown label in the future. It is worth noting that 66% of the respondents would be “very likely” to do so.

Shoppers Guide for Agritourism Destinations – The Department of Agriculture compiled a list of viable agritourism and on farm markets that supported specialty crops throughout Georgia. The Agritourism Destinations guide was completed in 2015 and more than 20,000 copies have been printed. The guide was distributed as an insert in *the Georgia Trend Magazine*. We decided to include the guide in Georgia Trend Magazine instead of the Georgia Travel Magazine because Georgia Trend had a better circulation.

Specialty Crop Foodservice Website – Did not complete: Due to multiple issues with our current website and with procuring a website developer, we were unable to launch a specialty crop foodservice website during the timeframe for this grant. However, this is still part of our strategic plan for Georgia Grown and hope to develop this part of our website in the future.

Georgia Grown Food Show – Over the course of the grant we have performed several Georgia Grown food shows. Over 300 farms and specialty crop processed food producers have participated. The food shows have generated over \$200,000 in direct to consumer sales and close to \$1 million in future purchases.

Coordination and implementation of Point of Purchase Materials – Point of purchase marketing materials for Georgia Grown specialty crops have been designed and distributed to major retailers throughout Georgia. The new promotional materials are in grocery store locations such as Kroger, Harvey’s, Sprouts, Fresh Market, and dozens of IGAs. This project has been so successful that we plan to continue providing point of purchase materials to retailers.

Goals and Outcomes Achieved

GOAL #1

- By 2016, 416 grocery stores in Georgia had featured Georgia Grown signage identifying local specialty crops as a result of this grant program.
 - All 175 Kroger Stores
 - 73 Harvey’s/Bi-Lo grocery stores
 - 168 Independent Grocery stores
- Overall unaided awareness of Georgia Grown increased from 6% in 2012 to 33% in 2015. We believe this jump was solely caused by activities in this program and previous phases of this program.

GOAL #2 (INCREASED AWARENESS AND USE OF SPECIALTY CROPS IN RESTAURANTS)

The section of this grant dedicated to developing a website to increase the awareness and use of specialty crops in restaurants was not completed due to changes in staff and in the critical focus areas of the Georgia Grown program. The monies allocated for this goal were instead redirected to the Indirect Funds budget category, with the approval of USDA.

GOAL #3 (INCREASE THE SALE OF SPECIALTY CROPS BY 10% AT PARTNERING FARM STANDS OR AGRITOURISM LOCATIONS)

- 394 Agritourism Locations were advertised in over 20,000 copies of the Georgia Agritourism Guide.
- In the fall of 2016, a survey of agritourism operators was performed in partnership with UGA and the Georgia Department of Agriculture. Self-reported data by agritourism operators estimated that the increase of specialty crops at agritourism locations to be 8.7%. We hope that there will be a multi-year benefit from our promotions that generate greater sales in future years.
- According to a University of Georgia Study. The farm gate value of agritourism in Georgia has increased 36% over the duration of this grant, from \$142.3 million to \$194 million.

Beneficiaries

The Major beneficiaries of the Georgia Grown have been Georgia's Specialty Crop Fruit and Vegetable growers. Over the past three years we have seen increased growth in Georgia Grown specialty crops that utilize the Georgia Grown logo.

- Roughly 580 Georgia farms currently use the Georgia Grown logo in the promotion of their specialty crops. These farms have received increase consumer awareness of their products, more locations to sell their products, and increased demand for specialty crops.
- The 394 agritourism locations throughout Georgia benefited by having their farms identified in our guide.
- The Kroger Atlanta regional grocery stores have increased their purchase of Georgia Grown specialty crop products by 30% over the last 3 years.
- 14.78% Increase in Georgia Fruit and Tree Nuts – According to USDA survey data on Fresh Market Fruit and Tree Nut Production totals from 2010 to 2014, Georgia increased its fruit and tree nut sales by 14.87%. This increase is significantly greater than all other neighboring states (Alabama, Florida, North Carolina, South Carolina, and Tennessee). In fact, all other neighboring states saw a decrease in fruit and nut production, except for North Carolina, which only increased by 6.2%. (USDA NASS QuickStats 2.0)
- Increasing Demand – In October 2015, Produce News Magazine reported on the success of the Georgia Grown program. Included in the article was a quote from Mike Jardina of Atlanta apple and stone fruit specialists the J.J. Jardina Co., "They do

a very good job and that really helps us with local product. Just the recognition they have brought to 'Georgia Grown' has really helped. We don't see an end for the demand for locally grown — our sales in Georgia apples are five times higher than they've ever been. Thank Commissioner Gary Black for that one. They're doing a great job. The Georgia Department of Agriculture is pushing the 'Georgia Grown' program very well."

Lessons Learned

- The Georgia Department of Agriculture put a hold on most of its SCBG spending during Calendar year 2014. The purpose of this hold was for the Department to review its budgeting, accounting and procurement processes in regards to SCBG awarded to the Department. We believe this review has been very successful and allowed the Department to make needed changes that will allow for more effective implementation and greater accountability of the SCBG funds. However, due to the hold the grant schedule was delayed one year.
- In addition, we found that there was significant benefit to market multiple commodities in combination. For example, a showcase highlighting multiple commodities under a common promotional theme, such as Georgia Grown, was more beneficial than promotional campaigns that only highlighted one commodity.
- We also learned that point of sale promotion materials were very effective in directing consumer purchasing toward Georgia Grown specialty crops.
- In the future, the Department of Agriculture will direct more focus on social media for promotions of specialty crops. Social media promotions can be directly focused on specific consumer groups and can be adjusted mid-campaign to take advantage of promotions that are having the greatest impact.

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Additional Information (photos, brochures, etc: Available from GDA upon request)

9). Georgia Public Broadcasting – *Pick Cook Keep-Continuing a Good Thing for Specialty Crops* – Final Performance Report

Project Summary

The 2013 Specialty Crop Grant funded a continuation of the comprehensive educational program done in 2012 to reinforce branding and increase awareness leading to purchase of Georgia Specialty Crops through multi platforms in a program called “Pick Cook Keep - Continuing a Good Thing for Specialty Crops.” This grant continued an initial 2010 funded project; the initial grant educated about Specialty Crops through multiple platforms with information including a brief history of each crop, its growth location within Georgia and an introduction to a local farmer- family who produced the crop.

From this 2010 beginning, we continued with the 2012 and then the 2013 grant showing the same specialty crops. We provided additional information and strategies to demonstrate their ease of use and storage of the crops to influence the behavior of Georgians, and to increase sales of Georgia Specialty Crops. This 2013 Grant allowed us to reinforce existing information while adding additional crops and information through multiple channels; (PICK) how the crop is grown and harvested, (COOK) how to use each crop as demonstrated by a Georgia Grown Executive Chef in easy to prepare recipes, and (KEEP) tips for correct storage of the crop to retain freshness and flavor for later use.

In the 2012 Grant, ten Specialty Crops were featured during their months of peak perfection. The 2013 Grant added three additional crops; Strawberries, Tomatoes and Nursery Crops for a total of thirteen Georgia Specialty Crops spotlighted from March through August. The schedule of crops was as follows:

- March: wine and pecans
- April: strawberries and tomatoes
- May: Vidalia Onions and greens
- June: peaches and blueberries
- July: melons and honey
- August: nursery crops, Specialty Crop vegetables, and apples

During each month of the six month campaign, multiple channels promoted seasonal crops using extensive assets. Georgia Public Broadcasting (GPB) used the 9 station television network, robust web support including the Pick Cook Keep web pages, and e-blasts to members

and supporters. The Georgia Department of Agriculture (GDA) used print in the Georgia Market Bulletin, Consumer Q's, press releases sent to local media outlets, and GDA's web support through social media, web site and e-blasts, and information shared with partners including Georgia Grown Magazine. Additionally, the UGA Extension Service with a presence in all Georgia counties promoted Pick Cook Keep and Georgia Grown materials through their county agents throughout Georgia.

Using the power of multiple channels and a strong partnership between two strong state agencies and the state university, in season Georgia Grown produce and products were touted and promoted as they became available. This grant informed Georgians about Georgia Grown Specialty Products so that consumers would knowingly make decisions with their dollars to support Georgia Grown Specialty Crops.

Project Approach

We continue to believe that today's consumers and head of households are media savvy, regardless of their educational background, age, gender or ethnicity. They need to receive information in a sophisticated manner because the veracity of the information directly correlates to the quality of the presentation. Therefore, all the information about Georgia Grown Specialty Crops in the Pick Cook Keep series needed to be a polished reflection of the recipient's standards for them to trust the content of the information. The Pick Cook Keep approach that had been established during past grants was again followed so that new vignettes mirrored and built upon existing materials. We again provided quality content on multiple platforms. Our approach was to get information out through multiple channels to show the ease and advantages of consuming Georgia Grown Specialty Crops.

In 2012, we created 10 three minute vignettes showcasing in season Georgia Specialty Crops as selected by the GDA. The 2013 Grant added 3 additional three minute vignettes to the series of Vignettes for a complete compliment of Georgia Grown specialty crops. This series of vignettes added content to that created in 2010 and archived as legacy vignettes on the GPB web site.

The 2012 and 2013 vignettes were mini "documentaries" opening with "broad brush" footage and copy about Georgia Grown as a recognized purchase category and included an animation of the Georgia Grown logo. The vignettes then progressed to a respected Chef, selected from the Georgia Executive Chef program by the GDA, creating an easy to replicate Georgia dish using the "in season" Georgia crop with accompanying Georgia ingredients. For the series of 3 Vignettes, two chefs were selected as our presenters. The Georgia Executive Chef Program was created by the GDA to partner with the Georgia Restaurant Association for statewide promotion of Georgia Grown Produce and Products, thus fostering relationships between chefs and farmers. Following the preparation segment, with the chef using the product in a step by

step recipe along with “how to” tips along the way, there was a crop preservation demonstration segment, helping the viewer understand how to easily store the selected crop for freshness and ease of use in future recipes.

All Pick Cook Keep information was broadcast on GPB Television and archived on a dedicated Pick Cook Keep web site as part of GPB’s robust web presence. The site includes tabs for each aspect of the project: Episodes, Recipes, Chef Bios, Crop Calendar, Join Georgia Grown, and Partners. Additionally, each month the vignette was broadcast to television audiences during the GPB Cooking block of programming on Saturday afternoons or during a Prime Time rotation in the evenings between 8p and 11p, and the information about “in season” crops was reinforced through GPB web links, E-Blasts to members, I-Magazine and through our GDA and UGA Partner resources including print, web, events and social media including Georgia Magazine, Consumer Q’s, etc. This project had the full support of the GA Department of Agriculture with Commissioner Black being an active spokesperson.

Goals and Outcomes Achieved:

Department of Agriculture					
<i>Impressions 10.01.13 to 8.30.14</i>					
	Number Due		Unit #	Total #	Sub total
GPB Television	52				
Prime Time		14 Vignettes	73,846	1,033,846	
Cooking Block		38 Vignettes	40,000	1,520,000	
Sub total		Delivered 52		2,553,846	2,553,846
Web					
GPB run of site Ad		GA Grown		628,902	
GPB.org Pick Cook Keep web site	landing page		7,500	150,000	
GPB.org - Home site	landing page	12 months	40,000	480,000	
GPB E blasts	Members	2	113,000	226,000	
GPB-I Magazine	App	May-June		4,000	
GDA Newsletters	Web	6	27,222	163,332	
GDA Facebook	Web		10,995	76,685	
Market Bulletin	Web			32,031	
UGA Extension		156	3,200	500,000	

EMC Digital Mag	May	1	23,342	23,342	
Sub total				2,284,292	2,284,292
Print					
Market Bulletin		9	40,693	366,237	
Consumer Q		2	50,000	100,000	
GDA to news partners	48 times	48	10,000	480,000	
UGA Press Releases GA Grown	15 times	10,000 ea.	800 media outlets	12,000,000	
Sub total				12,946,237	12,946,237
Outreach					
GPB Sports - Commissioner Black		football pre game	13,834	13,834	
State Fair/Perry				228,000	
Moultrie				75,000	
HEFG Expo		Jan-14		2,000	
UGA Agent Demos at Farmers Markets		100	50	5,000	
UGA Extension	5th & 6th Graders	strawberry smoothies		10,000	
4H demonstrations		250	10	2500	
Gov. Conference				1800	
Fruit & Veg Growers				3800	
Sub total				341,934	341,934
Total Impressions					18,126,309

Beneficiaries

Using the power of Multi Platforms and all possible Channels including all the assets of Georgia Public Broadcasting, The Georgia Department of Agriculture and all our joint Partners, the beneficiaries of this project have been and continue to be Georgians who receive information leading them to become more informed as consumers. Information was provided to Georgians where they “live, work, and play” helping them make informed nutritional decisions and tasty choices in expanding their repertoire of dishes to prepare for themselves, their families and their friends. Georgians who watched GPB Television, visited the GPB web site, received E-blasts from GPB Education, GPB Member Services, received Social Media, visited GDA’s web site, print publications, local newspapers containing materials sent out by the GDA, received Georgia Magazine, a publication of the Electrical Membership Corporation, and Chef

newsletters received Georgia Grown Specialty Crop information about what fresh, assessable Georgia Grown Produce and products could be purchased in season at Farmers Markets and local grocery stores across Georgia.

GPB Television was projected to reach 1,070,160 adults age 18+ and we doubled our projection and reached 2,553,846 based upon Nielsen ratings for 52 broadcasts of Vignettes; 14 broadcasts during Prime Time and 38 during the Saturday afternoon cooking block of programs over 6 months.

Our web impressions were projected to reach 1,200,000 and we reached over 2,260,950 including GPB.org home page, landing pages, web ads, Social Media, E blasts, GDA's web site, specialty pages, On line publications, Georgia Magazine's Digital Magazine content and UGA Extension Service's Web Support. These numbers continue to grow as the materials are archived for visitors to view.

As a bonus, we reached over 12 million in print with outreach from Market Bulletin, Consumer Q, GDA news partners including Cordele Dispatch, The Times – Gainesville, The Herald Leader – Fitzgerald, Lincoln Journal, Jackson Progress Argus, Times/Herald – Newnan, Griffin Journal, Herald Journal – Greensboro, Americus Times/Recorder, Rome News/Tribune, Monticello News, Donalsonville News, Lake Oconee News – Eatonton, Courier Herald – Dublin, Pierce County Press, Advocate Democrat – Crawfordville, and the Thomaston Times and the UGA press releases to over 800 media outlets 15+ times.

Our event goals were reached by having a presence in the Georgia Grown pavilions in Perry (State Fair) and Moultrie (Sunbelt Ag Expo), but because of the set-up of the display and the movement of attendees, we were not able to complete surveys there. There were 228,000 people who visited the pavilion in Perry and saw the Pick Cook Keep information on monitors throughout the dedicated Georgia Grown pavilion. In Moultrie, at the Sunbelt Expo, the Pick Cook Keep videos were viewed by 75,000 attendees.

GPB had a booth at the Hospitality Education Foundation of Georgia's (HEFG) Hospitality Expo at the Georgia International Convention Center where over 2,000 students from Georgia High Schools and Technical Schools attended. A Georgia Grown survey was completed by 226 attendees. The survey asked if they were familiar with Georgia Grown before they studied their school unit and if the information was helpful and influenced family purchasing decisions. Survey results indicated that once students were introduced to information about Georgia Grown produce and products, they overwhelmingly selected them with 161 students stating that they would select them at the store.

In support of Pick Cook Keep and Georgia Grown, Commissioner Black attended a High School Football game at Milton High School. He cooked Georgia Grown produce and poultry for the

entire production team at the game, met the public as they came to the game, had huge signage outside the entrance gate including a backdrop, smoker, wrapped auto and then had a Georgia Grown booth within the entrance gates with Pick Cook Keep Vignettes playing and materials available for attendees. The Commissioner was part of the pre-game show, cooked a “tail-gate” meal on television while surrounded by Georgia Grown produce and products, and then spoke about all of the assets in Georgia for the audience.

The UGA Extension Service used the materials about Pick Cook Keep for their local extension service agents who are placed in every county in Georgia. Over 10,000 fifth graders used Georgia Grown produce during their summer camp classes and 4-H students enrolled in nutrition and food demonstration projects and provided 250 community class/presentations about Georgia specialty crops. At the April Governor’s Conference in Savannah over 1800 County commissioners and their families saw the Pick Cook Keep Vignettes, and over 3,800 people saw them at the Fruit and Vegetable Growers Conference.

We are very proud to have reached over 18 Million impressions using multi-platforms and via partner support from GDA and the UGA Extension Service.

Lessons Learned

When the best chefs use fresh local specialty crops and present easy to prepare dishes in a step by step manner, the audience is empowered to make nutritious, quick and easy to prepare, foods for themselves, friends and families. There is something transformative that happens when our audience for Pick Cook Keep, be they viewers, listeners, readers, or visitors, are shown why and how to use Georgia Grown local produce and products.

Information served up through all platforms and channels drive consumer awareness and ultimately consumer behavior and purchase decisions. True education includes the implementation of a comprehensive and quantifiable plan leading to increased awareness and increased sales of Georgia Grown Specialty Crops. The power of the media, the power of organizational Partnerships, and the power of quality accessible produce and products continue to lead to the success of the Georgia Grown program.

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Additional Information:

www.gpb.org/pick-cook-keep

http://www.nxtbook.com/nxtbooks/gemc/georgia_201404/#/22

10). Georgia Restaurant Association - *Georgia Farmers Take Center Stage at Georgia Restaurants and Georgia's Tables* – Final Performance Report

Project Summary

The main objectives of this project were to introduce Georgia's farmers to Georgia's restaurateurs via events throughout the state showcasing seasonal specialty crops to active and interested consumers. The Edible Agriculture Tour (EAT) GA tour doubled our objective by connecting 21 farmers with eight restaurants, 21 chefs, two festivals and one expo, thus increasing Georgia specialty crop familiarity across seven cities. Although the EAT GA program did not result in the projected 10 percent increase in Georgia produce sales, it did result in 69% of consumers reporting likeliness of purchasing locally grown fruits and vegetables and 83% more saying that they are likely to seek out Farm-to-Table restaurants in the future.

Project Approach

This project addressed the need to promote and sell quality Georgia grown specialty crop fruits and vegetables to restaurants and foodservice businesses to boost economic growth for Georgia farmers. The main objectives were to introduce Georgia's farmers to Georgia's restaurateurs and implement more than 12 dinners throughout the state showcasing seasonal crops to active and interested consumers. Our families must be educated and taught about the many benefits to eating healthy foods grown in Georgia's rich soil. The PR, marketing and media plan to promote this project included TV, radio, Internet and social media. The graphic design included photos of farmers, chefs, fruits and vegetables, along with finished recipes that included these Georgia specialty food crops and how everyone can patronize both the farmers and the restaurants.

At the onset of the project, The Project Manager began by reaching out to Georgia farmers and chefs/restaurants throughout the state regarding their willingness to be involved with the EAT GA program and participation in Tuesday Tasting Dinner events. Marketing material for EAT GA was produced. Events were hosted at Jekyll Island and in Roswell. During these events, consumer surveys were collected. Initial media outreach of the tour earned coverage in the *Atlanta Business Chronicle*.

Initial events were held primarily on Tuesdays; however, low consumer turnout and scheduling issues forced the team to abandon the Tuesday Tasting Dinner concept. EAT GA continued to be marketed and events scheduled. Following a brief transition period, the focus of EAT GA events shifted to include greater Chef/Restaurant and consumer participation. Events were held in Thomasville, Atlanta, Athens, Savannah and Decatur.

The EAT GA program was featured during a panel discussion at the Atlanta Foodservice Expo in Atlanta. The panel addressed many of the concerns from restaurants about sourcing local produce. Additionally, EAT GA participated in the St. Simons Food & Spirits Festival. There, an analysis of Chef/Restaurant and Farmer surveys was conducted.

Events Summary

Venue	Event Summary	PR/Marketing/Media
Georgia Organics Farmer's Feast	EAT GA participated in an event held at Jekyll Island. Featured Chefs included Matthew Raiford, Dave Snyder, Abigail Hutchinson, Kate Buchanan, Deb Farina, and Steve Ingersol.	EAT GA website Georgia Organics website Social Media: @eatgaGRA Facebook coverage
Table and Main	An event was held at Table & Main in Roswell, Georgia. The Chef that evening was Woolery "Woody" Back who created a measure incorporating specialty crop from Truly Living Well.	Poster EAT GA cards EAT GA website Social Media: @eatga GRA newsletter GRA events website GRA Facebook coverage
Sweet Auburn Curb Market	An event was held at Sweet Auburn Curb Market in Atlanta, Georgia. Chefs from Grindhouse Killer Burgers, YumDiggity, Sweet Auburn BBQ, Le Metro Creperie, Miss D's New Orleans Style Candy and Rawsome Juicery created special dishes	EAT GA website Social Media: @eatga Poster Taste of Atlanta "Bite of News"

	to highlight the best of Georgia's locally grown produce. Farms featured were Sparta Imperial Mushrooms, 3 Porch Farm and Woodland Gardens Organic Farm.	(including overview of tour) GRA newsletter (2x) GRA Facebook coverage GRA LinkedIn discussion group GRA events website
Liam's Restaurant	An event was held at Liam's Restaurant in Thomasville, Georgia. The Chef that evening was Chef Michael Stanley. There were 50 attendees who were served a four-course meal featuring specialty crops from Georgia Coastal Gourmet Farms, Serenbe Farms, Walker Organic Farms and Georgia Olive Farms.	Promotional material was distributed via Checkstuffer and GRA newsletter electronic distribution. EAT GA website Social Media: @eatga Press Release (AmericanTowns.com, Eventsetter.com, Eventful.com,) Radio (WPAX (1240 AM), WTUF Radio) GRA newsletter GRA Facebook coverage GRA non-member newsletter GRA website events
St. Cecilia	An event was held at St. Cecilia in Atlanta. The Chef that evening was Chef Craig Richards. The meal featured specialty crops from Dillwood Farms, BesMaid Garden Essentials and Woodland Gardens Organic Farm.	EAT GA website Social Media: @eatga Custom EAT GA menu Taste of Atlanta "Bite of News" GRA newsletter GRA website events

Heirloom Café & Fresh Market	An event was held at Heirloom Café & Fresh Market in Athens, Georgia. The Chefs that evening were Sal Speights (Heirloom Café), Mathew Palmerlee (The Branded Butcher), Aaron Phillips (Last Resort Grill) and Brittany Gunter (Epting Events). They created a menu featuring specialty crops from Anderson farms, DaySprings Farms, Front Field Farm, Sundance Family Farm and Schermer Pecan Company.	<p>EAT GA website</p> <p>Social Media: @eatga</p> <p>Poster</p> <p>Event Flyer</p> <p>Outdoor signage</p> <p>GRA enewsletter</p> <p>GRA website events</p> <p>GRA Facebook coverage</p> <p>GRA LinkedIn company page</p> <p>Epting Events blog coverage</p>
Les Dames d'Escoffier	An event was held at the Les Dames d'Escoffier Member event in Atlanta. The group was engaged in learning about the Georgia Grown products and also hearing from Commissioner Gary Black on the work at the Georgia Department of Agriculture. The room was filled with influencers in the Atlanta food scene and was a target-rich environment to share the mission of the EAT GA tour.	<p>Specialty Crop Recipe (using Vidalia Onions)</p> <p>Social media: LDEI Facebook page</p> <p>EAT GA poster</p>
Soho South Café	An event was held at Soho South Café in Savannah, Georgia. The Chefs featured that evening were Brandy Williamson, Executive Chef; Jacob Hammer, Local 11ten; Brian Gonet, Executive Chef at The Public Kitchen and Bar; David Ouimet, Purple Sage Catering; Adam Turoni, Chocolat by Adam Turoni; and Jay Cantrell, NLAws Produce. This event had 46 attendees and featured a cocktail reception followed by a six-course seated dinner.	<p>TV Segment (Good Day Savannah)</p> <p>News Segment (WJCL)</p> <p>News Print (DO Savannah & SavannahNow.com)</p> <p>Press Release (AmericanTowns.com, Beta.spotted.savannahnow.com, connectSavannah.com)</p>

		<p>Blog article (EatitAndLikeit.com)</p> <p>Savannah Magazine After Hours</p> <p>Poster</p> <p>Pop up event banners</p> <p>EAT GA website</p> <p>Social Media: @eatga</p> <p>Recipe emailed to attendees post-event</p> <p>Taste of Atlanta “A Bite of News”</p> <p>GRA enewsletter</p> <p>GRA Coastal enewsletter</p> <p>GRA LinkedIn company page</p> <p>GRA in the news coverage</p>
Parker’s on Ponce	An event was held at Parker’s on Ponce in Decatur, Georgia. This event had 35 attendees and consisted of six dinner courses with wine parings, and featured local products from Springer Mountain Farms, Yonah Mountain Vineyards, Enchanted Springs, BesMaid Gardens, Oliver Farms.	<p>Poster</p> <p>Printed menus</p> <p>EAT GA website</p> <p>Taste of Atlanta “A Bite of News”</p>
St. Simons Food & Spirits Festival	EAT GA participated in the St. Simons Food & Spirits Festival on Saint Simons Island by sponsoring farmers and chefs collaborating using Georgia produce at The Grand Oaks Tasting Tour.	<p>Specialty Crop Recipes shared with attendees</p> <p>EAT GA website</p> <p>Poster</p>
Atlanta	The Atlanta Foodservice Expo was held	EAT GA website

Foodservice Expo	at the Georgia World Congress Center in Atlanta. A panel discussion featuring speakers from the restaurant, foodservice and farming industries was organized in order to further educate consumers on the benefits of locally sourced ingredients.	Social Media: @eatga Pop up event banners Poster
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*Event marketing materials and photographs are *available upon request from GDA*.

Goals and Outcomes Achieved

The objective outlined in the grant was to match a minimum of 10 farmers with 10 restaurants to increase restaurant purchases from farmers by 10 percent. The Edible Agriculture Tour (EAT) GA tour doubled this objective by connecting 21 farmers with 8 restaurants, 21 chefs, 1 conference, 1 festival and 1 expo, thus increasing Georgia specialty crop familiarity to farmers across the state.

During EAT GA events, 21 Chefs created menus featuring Georgia specialty crops. Events were hosted in four of the 10 cities outlined in the grant (Roswell, Atlanta, Athens and Savannah). Additional events were hosted in four supplementary cities (Jekyll Island, Thomasville, Decatur and Saint Simons Island). Also, four events were hosted in the target city of Atlanta, bringing the total to 12 events across 8 cities.

Although EAT GA doubled its projected exposure, restaurants and farmers did not report any changes to their purchases or sales of specialty crops. However, restaurants reported a 20% increase in consumer inquiries about produce sourcing, leading those restaurants to consider expanding their menus to include more dishes using locally grown produce. The lack of increased purchases from farmers may be due to the unresponsiveness of participating farmers (60%) and restaurants (50%) to conduct benchmark, monthly and final surveys. Additionally, farmers reported higher sales at farmers markets (57%) than to restaurants and food distributors. When restaurants were surveyed about their purchasing habits, 40% reported availability and consistency of produce being a drawback of working with farmers.

In addition to attempting to increase produce sales, the EAT GA program also sought to increase consumer awareness of specialty crops. The majority of consumers who attended EAT GA events supplemented their weekly groceries with purchases from farmers markets. Many reported an interest in EAT GA events in order to get more information about local specialty crops and restaurant menus. Of the consumers surveyed, 12% reported rarely eating out and

33% reported eating out 1-4 times a week. *However, after attending an EAT GA event, 69% reported being more likely to purchase locally grown fruits and vegetables and 83% said they were now more likely to seek out Farm-to-Table restaurants, such as those who participated in EAT GA.*

Beneficiaries

The beneficiaries of this project were Georgia farmers, restaurants and consumers. The specialty crops targeted were fruits, vegetables, and tree nuts.

Although the majority of restaurants and farms who participated in the project reported already having an established working relationship and consistent sales, many *restaurants reported an increase in consumer interest in local sourcing*. Additionally, several farmers expressed their appreciation for programs that increased consumer awareness of locally grown produce.

Lessons Learned

Hosting events on Tuesday evenings may be a good night for chefs/restaurants, but resulted in a low consumer turnout. The best evenings/days for consumer-focused events are Thursday, Saturday and Sunday.

Limited personnel and personnel turnover took a toll on the execution of the program and resulted in a program overhaul in the third quarter. This may have led to the unresponsiveness of farmers and restaurants to surveys. Also, due to the personnel turnover, follow-up surveys were not consistent.

Farmers and restaurants reported already having an established professional relationship prior to participating in an EAT GA event in their city. In the future, EAT GA should attempt to connect farmers to restaurants not currently utilizing locally grown produce. Additionally, a suggestion is to promote a state-wide EAT GA day where all restaurants are encouraged to incorporate as few as one locally grown specialty crop item on their menu for one day.

Contact Person

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Additional Information

Attachments available upon request from GDA

11). Georgia Tech Research Institute- FIELD TESTING CHEMICAL SENSOR FOR EARLY DETECTION OF PESTS AND DISEASES-Final Performance Report

Project Summary

The project was ultimately successful in identifying *Armillaria* in Peach Trees under actual field conditions. The specific chemical compounds for *Armillaria* were identified using the micro-GC sensor. The ability to detect this disease is critical to the proper management an orchard. The micro-GC is a key enabling technology to allow for the detection of a variety of diseases based on the unique emissions of volatile organic compounds by the plants and trees. This work demonstrates the first successful field test of the micro-GC for identifying presymptomatic trees. This work will be the foundation of much work in the future.

Project Approach

The project was divided into two major tasks: Volatile Organic Compound (VOC) signature field validation and validation of the VOC signature in presymptomatic trees using the micro-GC. For the first task, the team collected air samples from infected and uninfected trees from the field. The samples were analyzed using a traditional gas chromatograph device at GTRI. This data was then processed using advanced statistical methods to identify the unique VOC signature of this disease.

The second task was a series of field experiments down at the USDA facility in Byron, GA. For this test, the micro-GC device was taken to the field and air samples were collected and processed by the micro-GC immediately in the field. The results of the micro-GC were then compared against the samples processed in task 1.

Goals and Outcomes Achieved

The results of this work were significant. The unique VOC signature for *Armillaria* was identified and verified in the field. Second, the micro-GC was able to detect this chemical signature under actual field conditions. This work is extensible to other diseases in peach trees and other plants/trees. This work is significant because it provides the growers with a new tool to identify presymptomatic plants.

MICRO-GC DEVELOPMENT

Millions of dollars are lost every year to *Armillaria* root rot caused by *Armillaria tabescens*. Early detection of the pathogen's presence and the stage of disease are vital in preventing the decay of tree. A study by Beckman (Beckman, Okie, Nyczepir, Pusey, & Reilly, 1998) reveals that a site with a known history of *Armillaria* root rot (ARP) increases the cause of peach tree mortality by 35%. We have previously investigated the VOC gases released by *Armillaria* cultured on agar nutrient medium by collecting the overhead space using GC-MS. GC/MS based pathogen detection methods measure the composition of metabolites released from individual fungi,

which are controlled largely by the genetic types and combinations of the metabolic pathways. Particularly including volatile organic compounds (VOC) released by infected trees GC/MS based method currently is the gold standard method for VOC analysis. However, the main challenge exists to live monitor the present and progress of the disease in the field. To this end we have developed a portable MEMS-GC system to pre-concentrate and measure these signature compounds in the field; however, the main limitation of the system has been the detection of the low concentration of these chemical signatures without unnecessary pre-concentration.

Table 1: Signature compounds identify as signature compounds released by *Armillaria*

NO	Compound	Boiling point	Kovats Indices
1	Pentane	36	500
2	Acetone	57	503
3	Hexane	68	600
4	Benzene	80	662
5	1-Butanol	118	665
6	2-Pentanone	103	686
7	3-Pentanone	101	687
8	Heptane	98	700
9	1-Nitropropane	131	712
10	3-Methyl-butanol	131	732
11	Pyridine	115	746
12	Toluene	111	769
13	Octane	126	800
14	Nonane	151	900
15	Benzaldehyde	178	936
16	1-Octen-3-ol	174	979
17	3-Octanone	167	988
18	Decane	174	1000
19	Undecane	195	1100
20	Naphthalene	195	1100
21	Dodecane	216	1200

The micro GC system performance was previously evaluated for six know chemical signatures commonly released by Peachtree root rot. The performance of the TCD sensor was compared to a commercially available FID detector. The inlet and outlet of the TCD was connected to the 3 meters long GC column and a FID respectively. The GC system was operated isothermally at 80° C and the inlet pressure was set to 10 psi. 0.2 µl of mixture compounds was injected into the system and the results are shown in Figure 1.

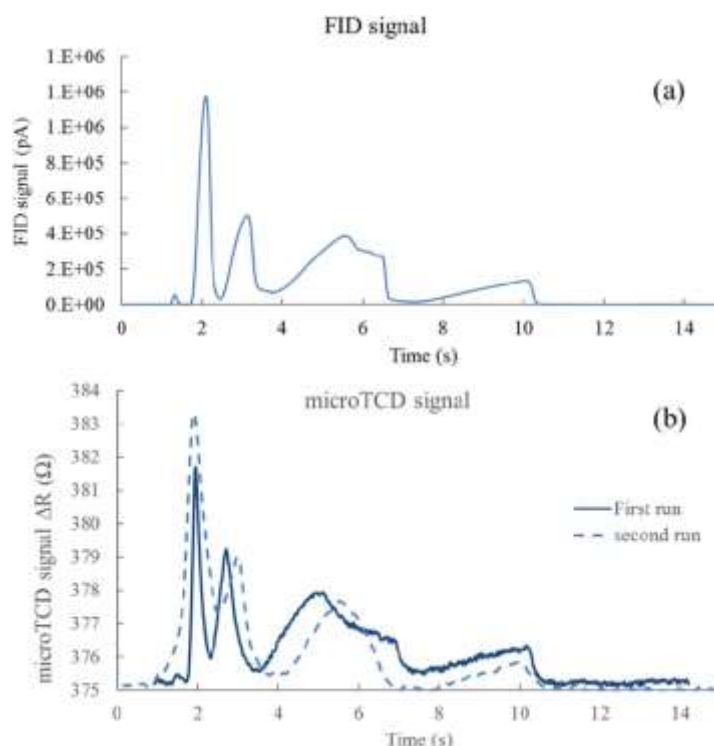


Figure 1 (a) Commercial GC-FID (b) MEMS GC signal

VOLATILE ORGANIC COMPOUND (VOC) ANALYSIS IN THE FIELD

Next, the performance of the MEMS GC system was evaluated in the field by measuring the VOC gases of healthy and infected trees; furthermore, several samples were brought back to the lab for further assessment. The point of this test was to provide guidelines for the future field tests in regards to the methods of VOCs sample collections (near the tree soil interface or trunk samples) and to estimate the concentration level of the chemicals in the samples.

The field test was performed by collecting the VOC gases of infected and healthy trees. The experimental setup is shown in Figure 2-b. The samples are labeled as S17209-03 for the healthy peach tree, and 7209-04 for the inoculated plant. The micro GC system was set at 15 psi, at headspace sampling rate of 15 mins and the pump frequency of 5 Hz. The data was collected at the trunk of the trees for 15 mins. As evidenced in the results there is a significant difference between the healthy and inoculated trees. The ANOVA statistical model shows a significant difference among the two sets of data which shows by a very large F factor. In all statistical comparisons, differences with $P < 0.05$ were considered significant. Further evaluation of the signature compound level in the field is necessary to use this technology as an early indicator of the disease and the stage of the disease; furthermore, this system can be used to identify the rootstock that could potentially be resistance to *Armillaria*.

Table 2: Anova statistical models used to analyze the difference among group means

SUMMARY						
<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>		
Inoculated	1500	4395953	2930.635	0.625257		
Healthy	1500	4364348	2909.565	3.84117		

ANOVA						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	332955.3	1	332955.3	149092.5	0	3.844562
Within Groups	6695.175	2998	2.233214			
Total	339650.5	2999				

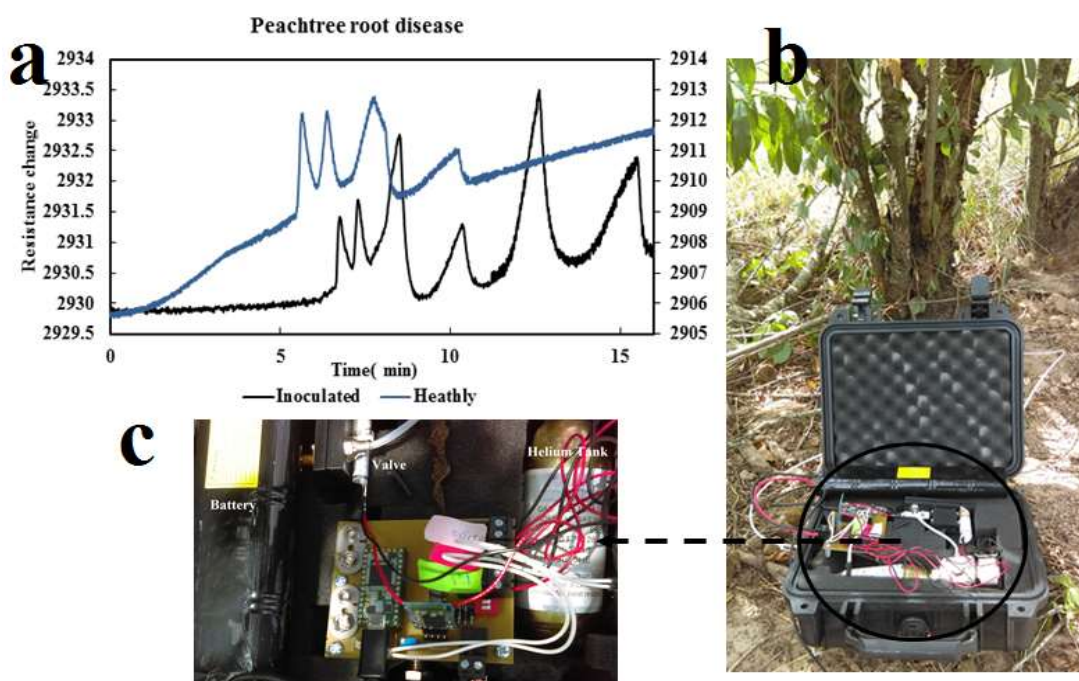


Figure 2 A) Chromatograph of inoculated and healthy Peach trees achieved using the 3 meter column at pressure 20 psi and sample time of 15 min. B) the experimental setup and the location where the VOC samples were collected c) system close-up view

To compare the results obtained using the MEMS GC system with the standard GC system, the overhead space of the samples were collected in two different vials and brought back to the lab for further analysis using a standard GC-MS. The plot below shows the results collected in the field and analyzed using a GC-MS system. The background results show strong agreement between the MEMS GC system and the VOC gases collected in the field. However, the MEMS GC system clearly distinguish the difference between the healthy and inoculated trees.

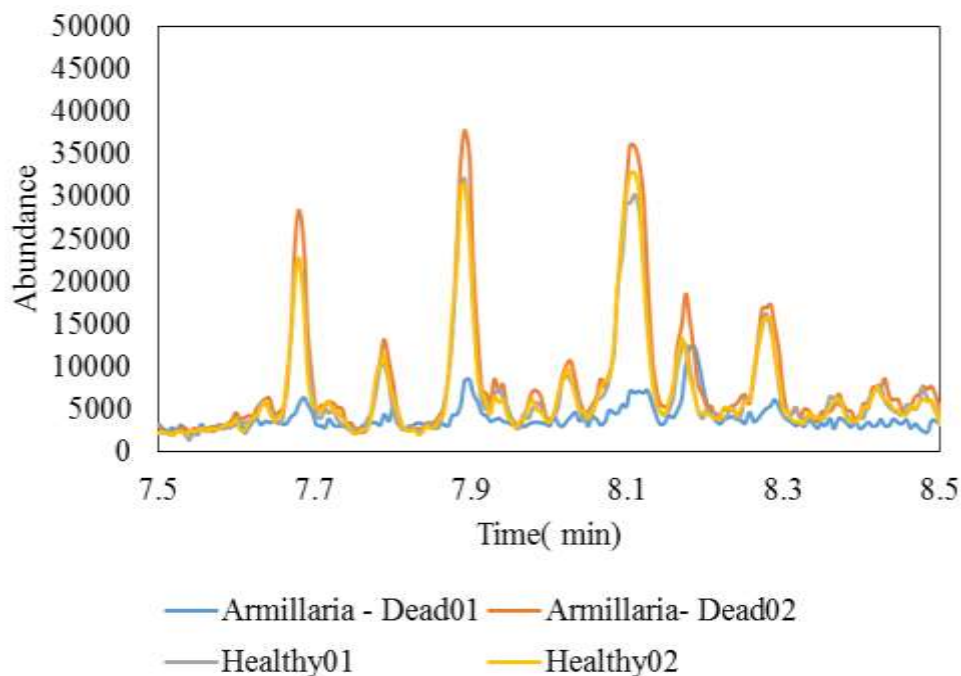


Figure 3: Standard GC-MS measurement

Beneficiaries

This project will have a significant impact on the disease management plan for peach growers. This project has developed the technology to allow growers to take samples in the field and identify presymptomatic trees and then pull them from the orchard to prevent the spread of the disease.

Lessons Learned

As with any technology development project, there were many unforeseen problems. This project was not immune to those issues. However, the team was ultimately able to achieve the results that were envisioned in the proposal.

The main problem was to integrate a pre-concentration and perform the pre-concentration of the VOC in the field since the concentration of these compounds are significantly small. To prevent further dilution of the VOC gases in the ambient environment, a tedllar bag system has been developed to cover the trunk or the leaf of the tree. The samples collected in the bag will be run using the MEMS GC system.

Contact Person

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Additional Information

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12). Hospitality Education Foundation of Georgia – Cooking Specialty Ingredients (CSI) - Final Performance Report

Project Summary

This project focused on teaching Georgia's high school culinary students the benefits of sourcing menu ingredients from specialty crops. By understanding how to use seasonal and local specialty crops in their menus and improving their skills, culinary students will select these items in their menus and inspire others to use specialty crops in their menus as well.

Changing students' selection habits was accomplished by teaching the culinary students and their teachers through repetition. Previous video educational materials taught us that repetition garnered greater results; therefore, with this project, we created an engaging educational video demonstrating specialty crops repeatedly. Teachers used this video to train students, who in turn performed public demonstrations, reinforcing their skills, and bringing awareness to their local communities. Studies show that familiarity increases purchase decisions. These students are on a track to become professional chefs. Without the knowledge imparted by our program, media fast food advertising could instead impact their food choices.

Creating an engaging instructional video targeted for high school culinary students increases their awareness of specialty crops and inspires a generation. *"I've been involved with mentoring, judging, and education for 15 years. Students need to emphasize more of Georgia's Specialty Crops. A focused video would have a sustainable impact on teenagers and encourage their menu choices"*, said Chef Tony Schmidt, video host and competition judge. There is a strong culinary education program in Georgia and this project is supported by teachers, mentors, and students by providing an educational resource that was otherwise unobtainable.

Project Approach

Part one of this project was the development of a forty minute instructional video designed to teach high school students how to select and use specialty crops correctly. The video reviewed selection, seasonality, preparation, and cooking methods, all with emphasis on food safety and sanitation. The video included information on how changing cooking methods affects flavors, how to improve flavors through choosing the right specialty crop, and how selection of seasonal specialty crops can enhance flavor. Specifically, the video emphasized the following specialty crops:

- Beets: Student menus have previously overlooked this healthy and flavorful crop. A full chapter was dedicated to providing an in-depth review of three methods of preparing, as well as purchasing, serving beets, and reviewing the different varieties.

- Onions: Students were not using onions in most menus. However, research showed that when they were used, the dish's flavors scored higher than when onions were not used. An in-depth review of Vidalia onions was filmed, including a section on proper selection, storage, preparation, presentation and a cooking method. To demonstrate their use and flexibility, onions appeared in two chapters of this video.
- Apples: Student menus have previously overlooked this important and versatile crop. Teachers recommended focusing on proper selection, so the video started with a clear lesson on selection methods and their uses. The remainder of the time was a review on storage and flavors. One cooking method was demonstrated as well.
- Cabbage: Students seldom selected this crop; however, research showed that when it was used, the menu performed well in competition. Teachers recommended focusing on how to improve taste; therefore, a full chapter was dedicated to providing an in-depth review of three methods of preparing, pairing, and selecting the correct cabbage to create the best flavors, in addition to reviewing different varieties of cabbage and their uses.
- Herbs: Research showed that higher-ranking teams utilized more herbs, so each section focused on specialty crops herbs in order to increase awareness.

The series was available without cost as a classroom resource for high school cooking programs. The DVDs were delivered to high schools to ensure Internet connections were not a limitation to school access. Teachers also received copies of the earlier videos to reinforce the full range of specialty crops that have been filmed to date.

Student teams participated in a statewide culinary competition, where they created three-course meals of their own choosing. Industry judges rated different aspects of the students' work, including a paragraph on how they were inspired when creating the menu. The scores were tabulated in a consistent method each year to determine changes in students' menu choices and overall skills with regard to the specialty crops filmed the Specialty Crop video.

Comparison of the 2013, 2012, and 2011 SCBG Projects:

Analysis continued on the progress of the 2011 and 2012 Specialty Crop Block Grant projects, even while we began the 2013 project. There were several distinct differences between the projects. While all projects demonstrated specialty crops, the 2011 SCGP project focused on the nutrition, menu production, plating, and sanitation of 19 specialty crops. The 2012 SCGP project focused on 18 cooking methods and how to improve flavor using specialty crops. 2013 focused on sourcing, seasonality, and selection of 17 specialty crops. See Table 1:

Table 1

24 Specialty Crops Were Highlighted in 2011 Specialty Crops Video

Artichoke	Asparagus	Bay leaf	Bell pepper
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Hospitality Education Foundation of Georgia

Blueberries	Garlic	Onions, green	Tarragon
Brussel Spouts	Ginger	Parsley	Thyme
Carrots	Mint	Peaches	Vanilla
Cilantro	Nutmeg	Shallots	Vidalia Onion
Cinnamon	Onions, red	Spinach	Zucchini

18 Specialty Crops highlighted in the 2012 Specialty Crops Video

Basil	Ginger	Shallots	Tarragon
Brussel Spouts	Mint	Spinach	Thyme
Carrots	Vidalia Onions	Squash, Acorn	Vanilla
Cilantro	Parsley	Squash, Butternut	
Garlic	Peaches	Squash, Spaghetti	

17 Specialty Crops highlighted in the 2013 Specialty Crops Video

Apples	Bay leaf	Beets	Bell pepper
Cabbage	Cardamom	Carrots	Celery
Cilantro	Dill	Fennel	Onion, green
Parsley	Star Anise	Thyme	Vidalia Onion
Vanilla			

Table 2

The Specialty Crops Analyzed 2011 – 2015 for the 2013 Specialty Crop Grant Study

Overall 28 Total Specialty Crops Were Analyzed at the Competition

Artichoke
Asparagus
Basil
Bay Leaf
Bell pepper
Beets
Blueberries
Brussel Spouts
Cabbage
Carrots
Cinnamon
Cilantro
Garlic
Ginger
Mint
Nutmeg
Onions, red
Onions, green
Onions, Vidalia Parsley
Peaches
Peppers
Shallots
Spinach
Squash, various
Tarragon

Thyme

Vanilla

Goals and Outcomes Achieved

This project contained the following program targets:

Target: Have ten teams participate in the competition and show an increased awareness of specialty crops by increasing their use by 10%. 11 schools competed in the competition. The number of specialty crops selected increased in a variety of ways.

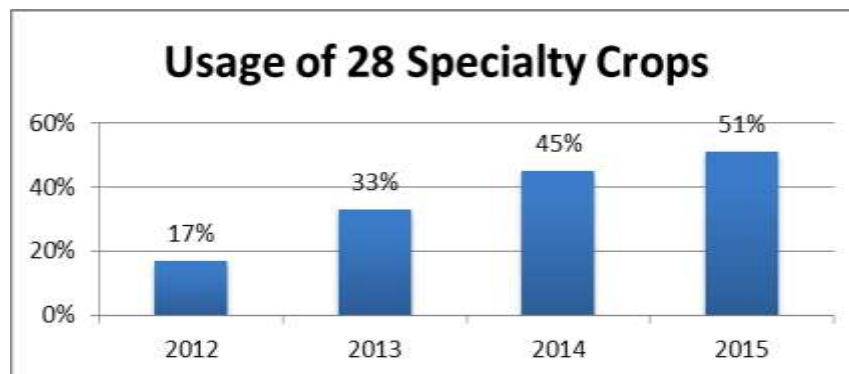
As outlined in our proposal, students demonstrated their growing awareness of specialty crops usage and products selection for their menus and increased skills when cooking specialty crops, as evidenced through the state culinary competitions and judged by the same executive chefs, year-to-year. Students were tested/surveyed prior to exposure to the project video at the March competition and following the viewing every year. The overall goal for the 2013 SCBG was to increase scores by an additional 10%. *As a result of this project, specialty crops usage increased in 2015 by an average of 51%.* This is detailed below in the section entitled, “Product selected for the menu.” Student skill evaluations increased by 11%; this met the goal of increasing by 10% and is detailed in the section entitled, “Skill Level Using Specialty Crops.” See details in Table 8.

Table 5

Percent of 28 Specialty Crops Selected by Students 2012 – 2015

2012 - before exposure 2013 - after 6-month measurement

2014 - after 18-month measurement 2015 - after 30-month measurement



Please note in the following analysis: The charts combine similar specialty crops, for ease of reading. For example, all types of squash are reported under “squash” and not separated butternut, acorn, spaghetti, etc. The number of total items did not change but the reports now list 16 items instead of 28. See Table 6 for details.

Table 6, The following procedure was used for grouping:

The same total number of specialty crops were analyzed from 2012-2015.

Herbs: Nine herbs were studied. The results are combined under ‘herbs’. These herbs are basil, bay leaf, cilantro, cinnamon, mint, nutmeg, parsley, tarragon, and thyme.

Squash: Six types of squash were studied. The results are combined under ‘squash’. These squash are summer Acorn squash, Butternut squash, spaghetti squash, and zucchini.

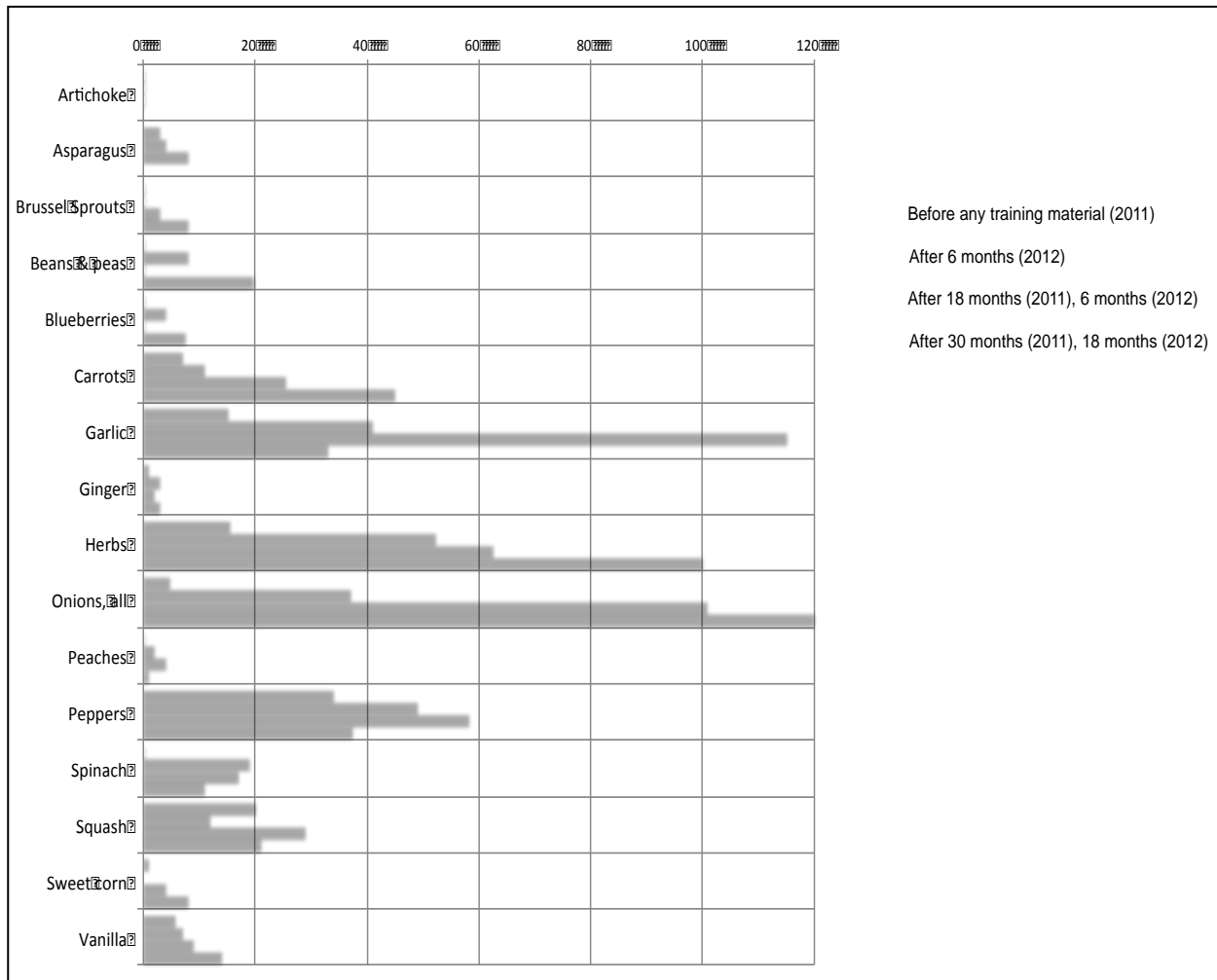
Peppers: All types of peppers were studied. The results are combined under ‘peppers’. These peppers are various colors of bell peppers.

Onions: Four types of onions were studied. The results are combined under ‘onions’. These onions are red onions, green onions, Vidalia onions, and shallots.

Year-to-year growth: When we look at specific crops, the growth is very dramatic. For example, if we look at onions, prior to the introduction of the Specialty Crop project, the teams used just over four (4) ounces of any type of onion. After six months of exposure to the training materials, the teams used about 37 ounces or just over two pounds of onions. And after 30 months of training and three sets of materials, the teams utilized well over seven pounds or just over 120 ounces. Prior to exposure to the project, few teams used herbs in their menus to improve flavors. After exposure, all teams were using the products throughout their menus. As students and teachers learn about specialty crops and their cooking methods, they are self-selecting them for menus from year-to-year. See Table 7.

Table 7

28 Specialty Crop: Usage at the 2012, 2013, 2014, 2015 Georgia Culinary Competitions



All products listed by ounce

Skill Level Using Specialty Crops: To evaluate the impact on their programs, we used the students' performances at the state competition. Evaluation of the students' use of specialty crops is critical to determine if the educational materials were successful. Over 25 industry chefs judged how the crops were utilized in the menus at the annual state culinary competition. The judges were consistent from year-to-year. The specialty crops were judged on over 20 different aspects and we found *the students did improve in most aspects. On a scale from 1 to 5 (5 being highest), the overall scores improved by 11%, meeting the project's overall goal of 10%.*

Comparing the Culinary Competition data from 2012 through 2015 in detail, we found:

- As their skills improved, the overall taste of their menus improved dramatically. This demonstrates improved skill in preparation to bring out greater flavor from the specialty crops.
- All areas continue to improve, excluding the difficulty of the crops selected for knife cuts. While some areas improved at a slower rate (Sanitation and Knife cuts 2%), the overall increase of 11% exceeded our goal of a 10% increase.
- Two other areas of double digit improvement included: (1) the student's ability to cut specialty crops. This is judged by 'cuts', which is determined by whether the completed cut is seen as perfect; and (2) 'skills' needed to cut specialty crops. These two skills were reinforced for three projects, the students jumped from -2% before any video exposure to dramatic increases each year.

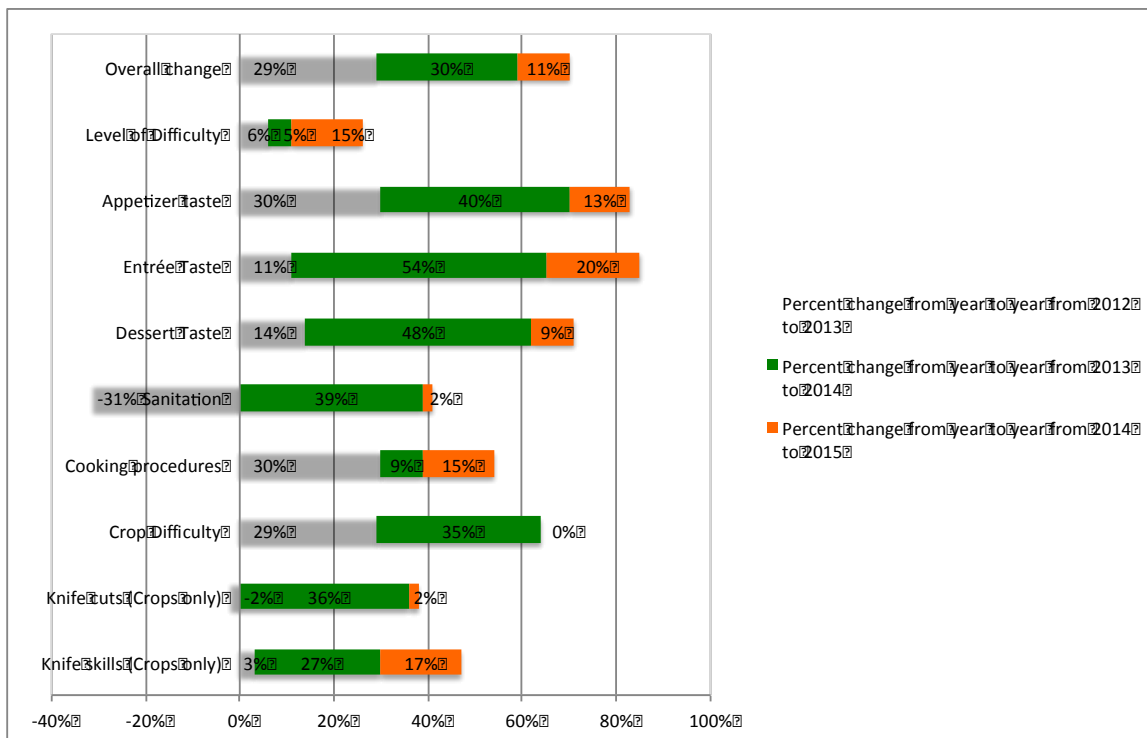
See details of the score in Table 8.

Table 8

Change In Team Scores Occurring at the Georgia Culinary Competition

From 2012 to 2013 by Percent and from 2013 to 2014 by Percent and

From 2014 to 2015 by Percent



To further demonstrate the impact on student skills, we can point to a national competition in which Georgia participates. Georgia's team ranking in the National Restaurant Association Educational Invitational has grown impressively each year.

In 2013, Georgia placed 16th out of 44 states competing.

In 2014, Georgia placed 3rd out of 46 states competing.

In 2015, Georgia placed 2nd out of 46 states completing, missing first place by less than one point.

Did students' demonstrations have an impact on the communities? Were the spectators influenced by the student's demonstrations of the specialty crops?

A survey distributed during community presentations was used to determine the effectiveness of the program. The responses are detailed below. Overall the reactions to the students' use of specialty crops were overwhelmingly positive and spectators indicated their increased desire to purchase specialty crops after tasting the student's dishes.

- All teams practiced their demonstrations with specialty crops more than 10 times before arriving at the demonstration. This achieved two things: 1) reinforced repetition of their skills; and 2) increased the amount of time working with specialty crops by each team.
- While students' gained additional knowledge from the demonstration it was not the only project goal. The secondary goal was to influence the community. This goal was recognized by 85% of the surveyed customers whose awareness of specialty crops increased, based on the student demonstrations. 12% had somewhat increased awareness and 3% and little or no change.
- As an evaluation of the effectiveness of the student's demonstration, the spectators were asked if the student's demonstration would affect their purchasing decisions. The response was overwhelmingly positive with 98% of the respondents indicating the demonstration would result in their purchasing the specialty crop.
- In evaluating the comments from the spectators, it appears the major impact in their buying decision came from the demonstration and access to the student's recipes.

Table 9
Customer Feedback on Student Demonstrations
Anonymous Comments

"The ratatouille was awesome and the student did a great job." Carrollton High School Demonstration
"I'm going to try to make this (ratatouille)." Carrollton High School Demonstration

"Good explanation; good presentation; Great tarts!; Keep up the good work!." Grovetown High School Demonstration
"The tart is delicious and the young people are pleasant and enthusiastic! Excellent job!." Grovetown High School Presentation
"Great job! I own a restaurant and the student did an excellent job. Dave Poe of Dave Poe's BBQ Marietta High School Demonstration
"This was an awesome experience. The spaghetti squash salad was very good. I will try to make this myself using the recipe list I received." Marietta High School Demonstration
"I appreciate the salsa recipe without a lot of sugar." Southeast Bulloch High School Demonstration
"It was great to see different ways of using fruits and vegetables." Southeast Bulloch High School Demonstration
"The vegetables tasted very fresh and were well made" South Forsyth High School Demonstration
"Too much lemon for me but the students did a great job" South Forsyth High School Demonstration
"The onion rings are outstanding. Very good product and exceptional service" Westover High School
"This is a great. The onions are great so are the cooks." Westover High School
"Excellent recipe. It was good to see many different ways to use the same item." Charles Drew High School Demonstration
"I can hardly wait to make this recipe at home." Charles Drew High School Demonstration

Additionally, website traffic increased: In January 2013, the videos were made available on the HEFG website and promoted through the HEFG's newsletter and the teacher training workshop. Between June and December 2012, an average of 300 people visited the HEFG website each month. *After the launch of the Specialty Crops video, in January 2013, the HEFG website visits more than doubled, with over 650 viewers each month.*

Beneficiaries

Direct beneficiaries of this project were approximately 5,800 culinary students and teachers who watched the video or participated in the Georgia competition. No less than 1,100 spectators of the student demonstrations on specialty crops benefited, since each group was required to make 100 portions. Each school reported serving more than the required amount. One team, Westover High School, reported making 300 portions.

Lessons Learned

This project was highly effective in increasing the awareness of specialty crops by the students and their communities. The video was also effective for improving the skills of students' use

and selection of specialty crops; however, with the difficulties of the website it was hard to determine the exact number of exposures. It is clear that the specialty crops that the students were exposed to the most were selected more often. Student skills also increased, most notably in the flavor area as they included more specialty crops in their menus. We cannot tell if this trend will continue without continuing to study this group; however, over the period of study the student's performed at a increasingly higher skill level demonstrating the educational video was highly effective and continued use of the video may reasonably be expected to have a continuing effect.

The master editors of the video delivered the final video later then our timeline required. When the videos were finally available to the schools, we discovered the website had an error that couldn't be corrected quickly. As such, we were unable to upload the video to the website before the competition. However the material was distributed to each school in DVD form prior to the community demonstrations. The prior videos were used to test the students' skills outcomes. The website is currently in process of repair and the videos was on the website by the fourth quarter of 2015.

Contact Person

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Additional Information

The videos can be found at www.hefg.org/resources/videos

13). Kennesaw State University - Remineralization Project for Organic Agriculture Class for the Institute for Culinary Sustainability and Hospitality at Kennesaw State University - Final Performance Report

Project Summary

This remineralization project sought to combine theoretical and applied education to produce a skill set in students at Kennesaw State University taking the CSH 3500 Organic Agriculture and Beginning Apiary Studies class to prepare them to respond to the growing crises on local, state, national, and international levels in terms of health initiatives and agricultural integrity as it relates to professional foodservice. Future foodservice professionals experienced first-hand the impact and outcomes of this remineralization project, particularly in relation to taste, nutritional enhancement, and yield. Based on these experiences, it was anticipated that those foodservice professionals would demand enhanced specialty crop foods in the future – which

will increase farmers' interest in implementing similar projects to meet the industry need. Savvy consumers pay premium for nutrient dense specialty crops, further enhancing the demand from local farms. By expanding the skill set of future foodservice professionals to include knowledge and abilities in understanding what to grow, how to grow it, and how to use it to feed the consumer, the impact would be exponential in how that affects the farmers and their specialty crops. This project was intended to create a new standard for food quality, both in nutritional composition and in taste. Finally, the project sought to enhance farmers' knowledge of remineralization in order to aide in their own growing to meet the increased knowledge/demand resulting from the participants' knowledge related to the grant.

Project Approach

The farm personnel (Robin Taylor and Michael Blackwell) were the KSU personnel responsible for implementing the grant objectives, as they were the operating team for the Hickory Grove farm. They took soil samples in 2013 to determine a baseline of the soil composition prior to implementing the grant. The farm site had previously been used as a cement mixing station by the Department of Transportation and even weeds would not grow on the site. The pH ranged from 7.7 to 8.4, with a variety of minerals ranging in the low-to-medium levels. The soil was determined to be need a variety of amendments (nitrogen, phosphate, potash, sulfur, and boron), and they commenced adding granite dust, 6 tons of chicken litter (to add phosphorus and nitrogen), and 1000 lbs of sulfur over the next five months. In the meantime, KSU was approached by Brad Remole, who was removing dirt from a former organic farm for development of a strip mall. Consequently, Brad donated approximately 1200 dump-truck loads of topsoil to the Hickory Grove farm site. The delivery of topsoil started in April of 2014, and continued for approximately eight months.

In the meantime, we started offering the CSH 3500 Organic Agriculture and Beginning Apiary Studies classes on the Hickory Grove farm. As part of the class, students willingness to taste specialty crop vegetables, including kale, cilantro, Egyptian onions, eggplant, peppers, mustard greens, tomatoes, squash, radishes, and broccoli, were assessed through pre- and post-testing/tasting, with a target of a 20% increase over the course of the semester. During the grant period, specifically between 2014 until Fall 2016, three hundred and thirty four (334) students enrolled in the CSH 3500 class. Overall, only 8% of the students refused to sample half or more of the food items in the pre-test. In post-testing, students tasted all of the specialty crops, and overall reported eating these items with significantly increased frequency.

At the beginning of the semester, students were also asked if they currently grew any specialty crops, with only 3% of students indicating in the affirmative. During the course of the semester, students kept a "tasting journal", and were asked to taste as many vegetables from the specialty crops list as possible, recording their tasting evaluations in their journal. At the end of the semester, students filled out a tasting survey, with 65% of students surveyed said they would now like to grow at least a portion of their specialty crops. When asked which specialty crops they would grow for themselves in the future, students indicated by preference:

Lettuce	41%
Carrots	39%
Kale	31%
Chard	26%
Onion	24%
Cilantro	17%
Tomato	14%
Mustards	1%
Radish	11%
Beets	7%

Finally, we wanted to educate farmers on the remineralization efforts at Hickory Grove. KSU's Auxiliary/Culinary and Hospitality Services created handouts that were administered to local farmers (see attached, *available upon request from GDA*). Further education efforts included a segment on PBS TV's Georgia Traveler show (episode 702, November 7, 2013) wherein remineralization efforts were described/discussed. Michael Blackwell spoke to the Cherokee County Master Gardeners at their September 2014 meeting about the successes and challenges of remineralization. Blackwell also created a Remineralization powerpoint that was disseminated to local farmers, had a booth at the KSU Farmer's Market where he also spoke to local farmers, and had a "Why Remineralize" booth at the KSU Earth Day Marietta Campus in April of 2016. He also served as a vocal advocate in his work in the community to advocate for remineralization.

Goals and Outcomes Achieved

Goal #1: to improve the mineral balance in specialty crop soils and create standards, certification and marketing in order to deliver to nutrient dense specialty crops to consumers.

Performance Measure: tissue samples and soil tests.

Benchmark: USDA studies showing a 60 percent decrease in nutrients.

Target: eight to ten percent (8-10%) nutrient content improvement in specialty crop soils.

As detailed above, soil additives and amendments were incorporated into the Hickory Grove soil in the large field. Additional soil tests were conducted in March 2013, January 2015,

September 2015 and April of 2016, and additional amendments and additives were adjusted accordingly. The Hickory Grove's primary challenge was the extensive depletion of the soil following the DOT's clearing of the land, and trying to correct the soil to be somewhat normalized. Overall, the soil samples showed an improvement of the pH to a range from 6.6 to 7.7, and with mineral improvement for potassium, magnesium, zinc, calcium and phosphorus.

Goal #2: increase consumption of organic specialty crops by students.

Performance Measure: pre and post-testing of students, tracking changes in food behaviors and self-reporting.

Benchmark: pre-test of students.

Target: increase students' specialty crop fruit and vegetable consumption by 20 percent.

As detailed above, we were very successful in increasing students' consumption of specialty crops, increasing from a baseline of 8% of the class refusing to sample half of the items to all students sampling at least six specialty crop items. In fact, a significant number of students were so empowered by their experiences in their respective classes, they decided to grow their own specialty crops.

Goal #3: educate local, regional and Georgia growers/farmers on the methods of remineralization and the outcomes of our project for nutritional enhancement of specialty crops, including summer squash, sweet corn, snap beans, tomatoes, peppers, mustard greens, turnips, radishes, and cabbage. Additional specialty crop items as allowed on the USDA's approved list were grown and tested accordingly, and were limited solely to those items on the approved list found at:

<http://www.ams.usda.gov/AMSV1.0/ams.fetchTemplateData.do?template=TemplateJ&page=SCBGPDefinitions>

Performance Measure: pre and post-test farmers knowledge of remineralization strategies through a series of free on-farm lectures/demonstrations and on-line webinars.

Benchmark: pre-test of farmers and growers knowledge of remineralization strategies. We would also pre and post-test the specialty crops through tissue samples to evaluate increases in nutritional density.

Target: increase farmers knowledge of how they can implement remineralization projects for their own specialty crops enhancement.

As detailed above, we engaged in targeted education of local farmers on the remineralization efforts at Hickory Grove. We were not able to create the on-line webinars, but after speaking

with farmers, were informed that many of them would not take advantage of an online mechanism. The one-on-one and group presentations received the most feedback, and seemed to be the preferred mechanism. Mr. Blackwell received positive responses from a number of farmers, and even worked individually with several on their own farms.

Beneficiaries

The first tier of beneficiaries includes the 334 students enrolled in the program who learned the multiple benefits of remineralization as they learned to organically grow specialty crop fruits, vegetables, herbs and spices for implementation in foodservice, specifically looking to increases in yield and nutritional density of the specialty crops including summer squash, sweet corn, snap beans, tomatoes, peppers, mustard greens, turnips, radishes, and cabbage. In addition to the students enrolled in the CSH 3500 class, there were a number of volunteers (through VKSU) who worked on the farm who also benefited from the grant implementation.

The second tier of beneficiaries included the community specialty crop farmers and growers (including the Cherokee County Master Gardeners) who had the opportunity to tour the KSU farm and/or attend community events teaching the remineralization strategies and methods implemented and the outcomes of the project or who received print materials detailing the process (which were also made available through the Cherokee Extension office).

A third tier of beneficiaries included the employers who hired students in the CSH program who have an increased knowledge-base of food sourcing, nutritional density, and growing that they can implement in the foodservice industry.

A fourth tier of beneficiaries included the customers who eat at the foodservice establishments where our CSH students are employed, as they may benefit from a greater focus on organic, nutritional, and healthy food. Anecdotally, several of our CSH students work at the Commons on campus, and often are discussing these aspects with the other KSU students.

A fifth tier included a variety of K-12 students who participate in class tours of KSU's Hickory Grove farm. We hosted approximately 8-10 schools annually for tours of the farm, with differing levels of detail about remineralization (high schools receiving more than elementary schools). An increase in dialogue about where our foods come from and how we grow was a benefit to all.

Lessons Learned

The Culinary Sustainability and Hospitality academic program began in August of 2013, and experienced explosive growth in the past three years. The basis of this grant was a unique and innovative partnership with KSU's Auxiliary Services, who oversaw farm operations and farm personnel for the KSU campus. As outlined in the original grant proposal, the Auxiliary farm personnel would be implementing the operational aspects of the remineralization project, while the director of the CSH program would oversee the faculty teaching the courses. Regrettably, this partnership experienced difficulties, as the academic director has no oversight

or ability to direct the actions of the farm personnel's day-to-day activities. Further, changes in the Auxiliary leadership in 2014 resulted in a new focus on the importance of the grant's implementation. The failings of the ability of the academic arm and the auxiliary arm to work together resulted in some delay on the project, particularly in the second half of the grant period. Efforts to re-engage the farm personnel continued through the grant period.

Our project implementation was also delayed by a unique and fortunate opportunity. The addition of approximately 1200 dump truck loads of topsoil to our Hickory Grove farm site was needed and necessary given the dilapidated state of the soil. This caused initial delay, but it was the failing of the internal partnership at KSU that resulted in the delay in the second half of the grant period.

Ironically, in the past month (10/2016), the Hickory Grove farm has been transitioned to fall under the leadership of the CSH program director (the academic arm). I would like to think that if we were given this opportunity again, we would impress the GA Department of Agriculture with our ability to implement the plans outlined. During the transition period, I have found various receipts and invoices that fell within the parameters of the grant, specifically items that were soil additives and soil testing charges. Unfortunately, I did not know that these invoices were generated during the 2013-2016 period, as I did not have any administrative oversight for the farm. In short, we did more work toward the grant objectives than we charged to the grant budget.

Contact Person

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Additional Information

Many of the individuals who were charged with implementing this grant left KSU over the past year, including Randall Shelton, Gary Coltek, Robin Taylor, and Michael Blackwell. The change in key players also diminished the implementation of the grant objectives. We are very appreciative of the support in the original award of this grant, and we are focused upon providing the best education for our farming community. As the CSH program moves forward with the Hickory Grove farm, we plan to continue remineralization efforts to increase nutritional density of our foods. We are optimistic that the lessons learned here will continue influencing our community.

14). Mustard Seed Projects - The 3x3 Project - Final Performance Report

Project Summary

After a site change and awaiting the passing of new Urban Agriculture ordinances by the City of Atlanta we were finally able to legally farm on site this past May 2015 on our site at 307 Walker Street Atlanta, GA. Before this, our growing was limited to research and development activities on site and teaching classes. Since the passage of new laws and the issuance of a business permit we have cleared a new 1 acre section to place additional crates for growing using the remaining funds from 2013 SCBG of \$1472.80. The property was a large tract of vacant land located in a historical district and when we first had access to the property the city of Atlanta had not yet passed these new ordinances needed to operate so activity on the land was limited to research and development as well as teaching classes to veterans and the local community.

Project Approach

We continue to go off site to promote our urban farming system and train individuals to grow organic produce. Classes take place at the John Hope Community Center, Morehouse College, our sites at 307 Walker St and 13460 Hopewell Rd, along with numerous invitations from church groups and other civic groups around metro Atlanta. Invitations to speak about the system have come from VFW, American Legion, Kiwanis Clubs, Chattahoochee Tech, and local high schools. The system next will be deployed at a Atlanta elementary school to integrate with the school curriculum in 2016.

Goals and Outcomes Achieved

We have achieved the goal of clearing formerly vacant land and using our mobile crate farming system while rehabilitating the land, thus proving the viability of our mobile farm. This past summer the garden/farm was used as a summer youth program and this fall the garden is being used as training garden for local senior citizens. Mini gardens have been constructed for disabled veterans in Warner Robins, Marietta, Atlanta, and Alpharetta. Our community extension garden is located at the John Hope Community Center

Beneficiaries

These include but are not limited to disabled veterans, local seniors, local youth, homeless persons, and the community as a whole. The effect on those that we have worked with has been positive and the way our system helps with so many different challenges has amazed us. A few examples are an amputee veteran can use a 4 crate method to grow instead of our traditional 2 crate system due to his 6'4 height. A senior is now able to sit beside her garden (3x3) and have 100% access to the entire garden from any side. A young woman with severe medical problems was able to build a mini farm on her deck to ensure the organic nature and quality of her food source. The kids from John Hope Community Center have a summer and

after school gardening program. By using local homeless men to help work the farm, we have been able to utilize horticulture theory to help 2 of the 3 leave their life on the streets. Everything above has benefited the community but the community continues to benefit from a large tract of land which was a blight to the area and when finished will be turned into a community park.

Lessons Learned

The biggest lesson learned is to be better prepared when working with the local government. The delays concerning project placement, historical ordinances along with urban farming ordinances. Not doing better research and not understanding zoning rules led to a long delay to the program. Most of all I learned I can't do it all myself and surrounding myself with more help has helped move the program forward.

Contact Person

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Additional Information

We were unable to train and certify the initial 30 veterans that we planned. This was due to a number of reasons including lacking the legal ability to grow immediately, inability to obtain permits until new legislation was enacted, and lack of additional funding. We were able to train 7 veterans from around various parts of Georgia who are using our system personally but also are exposing the system to the senior, disabled, and different urban communities. Each graduate of the 3x3 program has the obligation to pass their knowledge along to our different target communities. Our mission continues and we graduated a new group of veterans and people from around the community in March 2016. A new group began in mid-January 2016.

15). UGA-Precision Irrigation Technology- *Using Precision Irrigation Technology to Increase the Economic Competitiveness and Environmental Sustainability of Georgia Specialty Crop Producers- Final Performance Report*

Project Summary

The use of soil moisture sensor-based automated irrigation has been utilized to effectively control irrigation in both research and commercial settings. These studies sought to explore the possible benefits of sensor-based automated irrigation for commercial nursery producers and the potential of these types of irrigation systems to reduce the incidence and severity of oomycete (water molds) root pathogen infection.

In commercial nursery production, use of sensor-based irrigation cut irrigation water use in half. Historic grower irrigation practices and existing precision irrigation methods are thought to have resulted in the disparities in historical water use compared to sensor-based precision irrigation tools. Soil moisture sensor-based automated irrigation also reduced secondary (and thus overall) infection rates in inoculated greenhouse trials when plants were grown with

consistently low (but not growth-restricting) substrate water contents after inoculation with *Pythium aphanidermatum*. This suggests that primary infection and more importantly secondary infection could be reduced by maintaining a soil moisture level that maximizes growth but does not provide a pathogen-promoting substrate (wet) environment.

Background

Overview

Water scarcity caused by the effects of climate change, a growing population, and increased regulation will put greater pressure on horticultural producers to effectively manage water resources (STRZEPEK and BOEHLERT, 2010). Legislation regulating water use by specialty growers already exists in California, New York, Maryland, Delaware, and Florida, and is expected to become more widely adopted in the future. In Florida alone greenhouse and nursery producers near urban centers have seen their allowed consumption drop by 40%, where as in the past, consumption was unregulated (BEESON JR et al., 2004; MAJSZTRIK and LEA-COX, 2013). Accurate irrigation management is key to not only reducing horticultural water use but also managing plant health.

Climate change is predicted to raise the mean global temperature as well as alter patterns of precipitation (JURY and VAUX, 2005). At the same time the global population is expected to increase to approximately 9.5 billion, with half of the total population residing in urban areas by 2050 (UN, 2013). With irrigated agriculture estimated to account for 70% of all freshwater used by humans, increasing demand from urban and industrial areas will create scarcity for agriculture (FISCHER et al., 2007; JURY and VAUX, 2005). In the U.S., horticultural operations were estimated by the USDA to exceed 235 billion gallons of irrigated water in 2008 (USDA, 2008). Better irrigation practices will need to be adopted by horticultural producers in the future in order to maintain and increase current levels of production while conserving the water resources. Recently developed soil moisture sensor and wireless technology can help address water management while increasing economic competitiveness and reducing disease losses in specialty crop production.

Irrigation management

The majority of production of horticultural crops is done in containers, which present unique challenges for irrigation and nutrition management. Container volumes limit the amount of rooting substrate and consequently the amount of water available to crops, which increases susceptibility to drought stress compared to soil-grown crops. Accurate assessment of irrigation timing is one of the most challenging tasks in a nursery operation, and growers frequently irrigate out of precaution when in doubt of plant water needs (MILLION et al., 2007). Inappropriate application of irrigation water can contribute to run off, excessive water consumption, and increased disease pressure (CHAPPELL et al., 2013; INCROCCI et al., 2014). Soil moisture extremes, either flooding or drought events, can predispose a crop's root system to infection from many pathogens. These events do not have to be exceptionally severe to cause predisposition, and are within the range of growing conditions common to nursery environments (BLAKER and MACDONALD, 1981).

A number of irrigation methods are employed in nursery and greenhouse operations including: impact sprinklers, drip irrigation, and micro-sprinklers. Impact sprinklers offer the advantages of requiring little labor to operate and maintain once installed, however actual application of water can be affected by wind and canopy cover. Drip irrigation allows for more precise application of water at a lower pressure but requires greater input of maintenance and installation. Micro sprinklers improve upon the drip technology by increasing coverage of the root zone while still precisely applying irrigation, but require the greatest labor and maintenance investments (FERERES et al., 2003). All of these application methods can be successfully integrated to automated irrigation systems.

Current methods for regulating irrigation timing are based on individual grower experience and intuition with crops and weather conditions. Automating irrigation in commercial settings has largely been limited to the use of timers to turn irrigation on and off at set periods independent of plant water needs. Current crop water consumption modeling uses evapotranspiration rates derived from nearby weather stations and crop coefficients specific to individual crops and growing conditions. Nursery and greenhouse growers often cultivate a large variety of species for market, each with unique optimal growing requirements. Crop coefficients do not currently exist for the majority of specialty crops cultivated in horticulture and are unlikely to become available in the near future. This limits the application of evapotranspirative modeling in controlling irrigation in horticultural applications (BEESON JR et al., 2004).

Plant water need-based irrigation

A number of recent studies have utilized sensor-based wireless networks to automate irrigation in both research and commercial settings. In these networks capacitance sensors are monitored by a data logger in the field, which then wirelessly transmits an average of the readings to a computer located nearby. Capacitance sensors take advantage of the high dielectric of water when compared to the low dielectric of soil and are able to convert the dielectric reading into a volumetric water content (VAN IERSEL et al., 2013). While cheap and easy to use, most capacitance sensors require calibration to the soil or substrate that they are reading. Software developed for the network at Carnegie-Melon University for these studies, referred to as Sensorweb, allows users to configure irrigation scheduling as well as manually irrigate crops, all over the Internet (KOHANBASH et al., 2013). Chappell et al. (2013) documented the implementation and adoption of three wireless irrigation networks in commercial nurseries to monitor and automate irrigation. Commercial producers found value in the system and cited: “shorter cropping cycles, reduced disease incidence and severity, less fungicide use, increased sense of security, and the ability to expand the production area with currently available water resources” as benefits they saw from the use of wireless sensor networks. A recent study in commercial operations in Italy reported similar findings of reduced water use, runoff, and the number of irrigation events when comparing sensor controlled irrigation to traditional timer-based irrigation. Growers surveyed for the study reportedly could not determine which irrigation treatment was applied to a sampling of the trial crops and judged crop quality to be equal between all treatments. This is significant because the crops grown using soil moisture sensors to automate irrigation achieved a 40% reduction in irrigation

water use compared to traditional irrigation methods (INCROCCI et al., 2014). Economic analysis by Lichtenberg et al. (2013) reported that wireless sensor networks required greater upfront costs, but increased annualized nursery profits by 1.5 times over standard practice. Savings in labor, irrigation water, fungicides, fertilizers, lowered energy costs from pumping, and accelerated crop production times all contributed to making wireless sensor network controlled irrigation more profitable than conventional methods of irrigation. Sensor controlled irrigation has been used in two different research trials to determine water use and growth in petunias. Both studies reported that the automated networks were able to accurately control volumetric water content through increases in plant size and fluctuations in environmental conditions (KIM et al., 2011; VAN IERSEL et al., 2010).

Root disease

Irrigation is a primary factor in root disease susceptibility in horticultural crops, and proper management of soil moisture is key to reducing incidence. Root rot disease causing pathogens, including the genera *Phytophthora*, *Pythium*, *Rhizoctonia*, and *Thielaviopsis* are of major concern in the horticultural industry. *Pythium* is one of the most pervasive and economically impactful genera of root rot disease, with a wide verity of species that vary in their pathogenicity and host specificity (HENDRIX AND CAMPBELL, 1970). Drought and flooding stress, common to nursery production, have been demonstrated to reduce resistance to *Phytophthora*, a genus of oomycete plant pathogen closely related to *Pythium*, in *Rhododendron* (BLAKER and MACDONALD, 1981). *Pythium* spp. produce spores under a wide variety of conditions, but are thought to germinate and release mobile zoospores, which cause infection, in near-saturated, saturated, or flooded conditions (STANGHELLINI AND BURR, 1973). *Pythium* spp. differ in their resistance to the limited number of commercially available fungicides used to combat their growth (MOORMAN et al., 2004). The use of cultural practices and strict sanitation procedures can be used in place of, or conjunction with chemical controls combat the establishment of *Pythium* spp. Observations by Chappell et al. (2012) suggest that the use of sensor-based automated irrigation system resulted in a reduction of losses due to disease in *Gardenia augusta* "Heaven Scent." This may be due to a reduction in suitable root zone environmental conditions that favor plant pathogen development when using sensor-based automated irrigation.

Significance and Rationale

Conventional irrigation is based largely on grower intuition and experience with a crop, which leads many growers to irrigate out of caution when they are in doubt. Elevated soil moisture contents have been shown to predispose crops to root pathogen infection and thereby increase crop losses (BLAKER and MACDONALD, 1981; RHOADES et al., 2003). Crop losses from disease for some specialty crops can approach 30%, significantly impacting growers' bottom lines. Preliminary data and observations from case studies conducted in commercial nurseries have suggested a relation between the use of wireless sensor network controlled irrigation and a reduction in crop losses due to disease (CHAPPELL et al., 2012). To our knowledge there has been no controlled study which has explored this relationship. My research evaluated the incidence and severity of root rot diseases when using sensor-based

automated irrigation to precisely control soil moisture content in studies conducted at the UGA greenhouses. In addition, several studies have demonstrated the economic feasibility of implementing wireless sensor networks in commercial nurseries (CHAPPELL et al., 2013). In all of these studies researchers controlled the soil moisture based automated irrigation system with minimal input from growers. We conducted two case studies with commercial specialty crop producers in which control of the sensor-based automated irrigation was handed over to the grower to determine if similar benefits to more controlled studies would be observed.

The potential to reduce crop losses from root rot diseases, while speeding cropping times, through the use of moisture sensor automated irrigation could significantly improve the economic competitiveness for individual growers and increase industry profits. Widespread adoption of moisture sensor technology could also be associated with environmental benefits, including substantial reductions in irrigation volume and subsequent reductions in runoff of fertilizers and pesticides from horticultural operations, thereby reducing watershed contamination (LICHTENBERG et al., 2013).

****To enhance readability, the two studies conducted as part of this project are reported independently within each section.*

Project Approach

Study I: Implementation of soil moisture sensor-based automated irrigation in woody ornamental production

Experimental design

Side by side comparisons of sensor-based irrigation and grower managed irrigation were conducted in 2014 and repeated in 2015. Irrigation zones were established, each consisting of five lines of rotating impact sprinklers (1/2 inch, 2045-PJ, Rain Bird) on 1.2 m risers spaced 3 m apart. Sampling blocks, made up of 125 plants per species (500 plants per irrigation treatment), were established within each irrigation zone and surrounded by a buffer crop. Trials were initiated once the sampling blocks were established and the sensor-based irrigation system was turned on. In 2014 the trial was initiated on 25 Aug. 2014 and continued through 14 Nov. 2014, while in 2015 the trial began on 23 April 2015 and ran until 5 Nov. 2015. Data (cumulative crop water /irrigation use, plant growth indexes, plant quality ratings, and electrical conductivity/fertility readings) were collected on a monthly basis in 2014 and every three weeks in 2015.

Commercial partner and plant material

A medium sized commercial woody ornamental nursery was selected to participate in this study based on willingness to adopt new technology, openness to allowing research to be conducted on site, and expressed interest in automated irrigation technology. The nursery is located in Hart county, Georgia in USDA hardiness zone 8A, with approximately 5 hectares available for production. On-farm trials were conducted on a 4460 m² pad which was seasonally covered with 60% shade cloth. Plants were grown in trade size #3 (9.78L) black plastic containers that were filled with 100% composted pine bark (SunGro Horticulture,

Agawam, MA), amended with Micromax micronutrient mix (Scotts, Marysville, OH) and pH adjusted for each crop using dolomitic limestone. Trials utilized four different species of woody ornamental plants including: *Hydrangea quercifolia* 'Jet Stream', *Pieris Japonica* 'Prelude', *Rhododendron catawbiense* 'Roseum Elegans', and *Kalmia latifolia* 'Sarah'. These species were selected for similar water use requirements based on the grower's experience.

Irrigation control and environmental data

A soil moisture sensor-based automated irrigation system (Decagon Devices, Pullman, WA), and similar to systems used to control irrigation in three container nurseries by Chappell et al. (2013) was used in these trials. Five soil moisture sensors (GS3, Decagon Devices, Pullman WA) were distributed throughout the sampling block with two sensors placed in the *Rhododendron* crop and one sensor placed in each of the three remaining species. Sensors were inserted with the metal prongs inserted horizontally through the side of the pot and into the media. Soil moisture sensors generated volumetric water content (θ), bulk electrical conductivity, and soil temperature readings. Sensors were connected to a wireless node (nR5-DC, Decagon Devices) that could control irrigation through a 12 – V DC latching solenoid valve (075-DV, 3 in., Rain Bird, Azusa, CA). Sensor readings were taken every minute and the average was transmitted to a centrally located computer base station every 20 min using a 900-MHz radio (XSC; Digi, Minnetonka, MN). The base station utilized a web-based graphical user interface (GUI), referred to as Sensorweb, developed by Carnegie-Melon University (Kohanbash et al., 2013). This GUI had a website format which would be intuitive to most users and allowed for graphical display of data collection, establishment of irrigation set points, and extensive customization of irrigation scheduling. Irrigation set points were established after an initial monitoring period of 7 d, in which average θ were observed. Based on the observed θ sensor readings, recommendations from UGA extension specialists, and experience and intuition with the crop, initial set points were established by the grower. When θ values fell below the user defined set point an irrigation event lasting 300 s was triggered.

Environmental conditions in the experimental area and water usage by the two irrigation treatments were recorded using two additional nodes. Solar radiation was monitored with a PYR solar radiation sensor (Decagon Devices), wind direction and speed was monitored using a Davis cup anemometer (Decagon Devices), and temperature and relative humidity were monitored using an EHT sensor (Decagon Devices). Rainfall and overhead irrigation were monitored using a ECRN-50 tipping rain gauge (Decagon Devices). Irrigation water use was monitored using two Netafim IRT 3 inch flow meters (36IRT3F-MPE, Netafim, Fresno, CA).

Data collection.

Growth indexes were calculated by taking the product of the canopy height from the media surface, the width of the widest point of the canopy, and the width of the canopy 90° from that measure. Plant quality was evaluated on a standardized 1-10 scale that was established at each sampling date for each species, with 1 being a completely dead plant and 10 being a plant with vigorous growth, good foliar tone, and a symmetrical habit. Direct measures of electrical conductivity within the rooting substrate were taken utilizing a HH2 meter with attached WET-2 Sensor (Delta-T Devices Ltd., Cambridge, UK). Flow meter readings were taken

at every sampling period and also continuously logged on the computer throughout the trial. Plant mortality was noted at every sampling date and dead plants removed from the experimental block at that time. Semi-structured interviews were conducted with the section grower and head grower about the performance of the sensor-based irrigation system at each sampling period. Grower attitudes and perspectives on the system were documented throughout the trial and a formal interview was conducted at the end of the 2-year period in which the owner was asked for his opinions and feedback on the system.

Statistical analysis

Growth indexes, plant quality ratings and electrical conductivity readings were analyzed using multivariate analysis of variance (MANOVA) over the course of each trial. Experimental set up was such that a single flow meter was used to track water usage in each experimental treatment in both years. Direct comparisons were made of total water usage and mortality numbers over the course of both trials.

*Study II: Sensor-based automated irrigation impacts *Pythium aphanidermatum* infection in *Petunia* × *hybrida**

Experimental design

Trials utilized a completely randomized design. Treatments included two inoculation treatments in combination with four irrigation regimes with each treatment combination replicated four times. A total of 128 plants were used in each trial, with each replication containing four plants in individual containers, that were treated as sub-replicates. A total of 32 irrigation lines were used (2 inoculation treatments × 4 irrigation treatments × 4 replications), each line provided water to the four sub-replicates based on the programmed irrigation regime.

Plant material

The experiment was conducted over four weeks starting on 8 July 2015 and repeated starting 1 September 2015 at the University of Georgia horticulture greenhouse complex in Athens, GA. Each trial consisted of a total of 128 *Petunia* × *hybrida* 'Dreams Red' seedlings transplanted from 128-cell plug trays into individual containers. Seedlings were purchased from C. Raker & Sons, Inc. for the trial conducted in July and produced on site for the trial conducted in September. Commercially available plastic opaque containers (10 cm diam. X 16 cm ht.) were loose filled with 1 liter of a peat and perlite based potting substrate. The trial in July utilized a substrate blend of 65% peat and 35% perlite (Fafard 1P; Sun Gro; Agawam, MA) while the trial conducted in September utilized a similar substrate blend of 80% peat and 20% perlite (Fafard 2P; Sun Gro). In both trials, the substrate was amended with 14-14-14 Osmocote Classic (Everris Inc.; Dublin, OH) fertilizer at a rate of 5.0 kg•m⁻³. All containers were hand watered for 14 days after transplant to allow for individual seedling establishment within the container.

Irrigation control and environmental data

Three irrigation treatments maintained soil moisture contents near threshold θ 's of 0.2, 0.3, and 0.4 m³•m⁻³ (corresponding to dry, moderate, and wet substrates) and one irrigation

treatment cycled between 0.18 and 0.43 m³•m⁻³, a change of 25% in θ between irrigation events (Fig. 2.1). Irrigation was controlled by a soil moisture sensor-based automated irrigation system similar to one constructed by Nemali and van Iersel (2006). A total of 32 irrigation lines were used, each with a corresponding soil moisture sensor (EC-5, Decagon Devices, Pullman, WA) that was inserted in the center of the container, at a 45° angle into one representative container per irrigation line. Soil moisture sensors were connected to a multiplexer (AM16/32B, Campbell Scientific, Logan, UT) that was in turn connected to a data logger (CR10X, Campbell Scientific) that recorded voltage output readings from the soil moisture sensors every 10 s. The data logger converted voltage readings to θ using a substrate specific calibration equation [$\theta = 1.13 \times (\text{voltage})^2 - 0.612 \times \text{voltage} + 0.0889$]. Two relay drivers (SDM-CD16AC/DC, Campbell Scientific) were connected to the data logger to control 32 solenoid irrigation valves (075-DV ¾ inch Rain Bird, Azusa, CA), one for each irrigation line. When sensor readings fell below θ thresholds, the relay driver powered the corresponding solenoid valve, irrigating the crop until θ readings exceeded the programmed threshold. Each container was irrigated with dribble rings (DR6, Damm, Manitowoc, WI) that were approximately 10 cm in diameter. Dribble rings were connected to pressure compensated drip emitters rated at 2 l/h (PCJ, Netafim USA, Fresno, CA). Air temperature and relative humidity within the greenhouse were measured with a VP3 probe (Decagon Devices). In July, the average daily maximum temperature and relative humidity were 27.6 ± 0.6 °C (±SE) and 87.5 ± 0.5% while the average daily minimum temperature and relative humidity were 17.5 ± 0.6 °C and 57.9 ± 1.6%. In September average daily maximum temperature and relative humidity were 23.6 ± 0.3 °C and 86 ± 1.0% while the average daily minimum temperature and relative humidity were 15.8 ± 0.6 °C and 62.8 ± 2.0%. Daily light integral was calculated using photosynthetic photon flux readings measured with a quantum sensor (SQ-110; Apogee Instruments, Logan, UT) and ranged from 10.0 to 41.4 mol/m²/day with an average of 32.5 mol/m²/day in July, and ranged from 6.5 to 35.7 mol/m²/day with an average of 22.1 mol/m²/day in September.

Inoculum production and inoculation procedure

Pythium aphanidermatum (Edson) Fitzp. (isolate 'M15D') originally recovered from symptomatic *Euphorbia pulcherrima* cultivated in Georgia and previously determined to be pathogenic on petunia (WILLIAMS-WOODWARD, Unpublished data), was used in this study. The isolate was maintained under diffuse light at 22°C on V8-PARP medium (15 g Bacto agar [Becton, Dickerson and Co., Sparks, MD]; 50 ml clarified V8 juice [Campbells, Camden, NJ]; 400 µl pimaricin [Sigma-Aldrich, St. Louis, MO]; 250 mg ampicillin [Sigma-Aldrich]; 10 mg rifampicin [Sigma-Aldrich]; 67 mg pentachloronitrobenzene (PCNB) [Terraclor; Chemtura, Middlebury, CT]; in 950 ml of deionized water) (JEFFERS AND MARTIN, 1986). Inoculum was prepared by filling 1000-ml Erlenmeyer flasks with 500 cc vermiculite mixture comprised of 500 cc fine vermiculite (Sta-Green, SunGro horticulture Distribution Inc., Agawan, MA.); 25 g of plain yellow corn meal (House-Autry, Four Oaks, NC); and 250 ml V8 broth (200 ml V8 juice, 2 g CaCO₃, and 800 ml deionized water). Flasks were plugged with a foam stopper, covered with tin foil and autoclaved twice for 60 min at 121°C over two consecutive days. Ten 5-mm diameter mycelial plugs from 1-week-old *P. aphanidermatum* cultures were aseptically transferred to each flask and gently shaken to distribute the plugs within the vermiculite mixture. Flasks were incubated

under diffuse light at room temperature (22 °C) for 2 days, gently shaken to break up and distribute mycelium, and incubated for an additional 5 days prior to use in greenhouse trials. In the greenhouse, a glass rod was used to create two, 5 cm deep holes in the rooting substrate of each plant to be inoculated. A total of 18 cc of colonized vermiculite mixture was distributed between the two holes in each container and re-covered with substrate. All containers were maintained at saturation for 24 hr to assure colonization of *P. aphanidermatum* in the substrate prior to re-instituting irrigation treatments.

Data collection

Plant quality was assessed weekly using a standardized 1-5 scale, where 1 = a dead plant; 2 = severely inhibited growth, wilting, widespread chlorosis and necrosis; 3 = impacted growth, poor habit, slight wilting, minor chlorosis and necrotic tissue; 4 = good growth and habit, possible weak foliar tone; 5 = a plant with vigorous growth, attractive habit and good foliar tone. Marketability of the crop was assessed at the end of the trial by analyzing the number of plants per irrigation treatment that had plant quality ratings of 4 and 5, which were judged to be of an aesthetic quality suitable for commercial sales. Mortality was tracked for each treatment combination and percent mortality was calculated based on the number of plants that died in each treatment combination over the course of both trials. At the end of each trial, all plants were cut at the soil line and dried for 72h at 85 °C then weighed to determine dry shoot weight. Roots were washed to remove as much substrate as possible, dried for 72 h at 85 °C and weighed to determine dry root weight. Fresh root samples were collected from each treatment combination prior to root washing and stored in a refrigerator at 5 °C until processing within 1-2 weeks. The root sub-samples were gently washed under running water and 20 1-cm root sections were randomly excised and embedded into V8 PARP medium. Embedded root sections were then incubated under diffuse fluorescent light at room temperature (22 °C) for 48 h before being examined microscopically for the presence of *P. aphanidermatum* hyphal structures. Infection rate was determined by comparing the total number of root pieces from which *P. aphanidermatum* growth was observed from to the total number of root pieces plated. Observed hyphal growth was subcultured onto V8 PARP medium and incubated at room temperature (22 °C) for seven days prior to pathogen confirmation.

Pathogen confirmation

The presence of *P. aphanidermatum* from cultured root sections was confirmed through amplification of the internal transcribed spacer (ITS) region using primers ITS1 and ITS4. A protocol modified from the Barber Ecology and Evolutionary Biology Laboratory at UCLA, CA (2004) was used for extraction. A sterile 20 µl pipette tip was used to remove a small amount of aerial hyphae that was then dipped in a sterile tube containing 300 µl 10% Chelex (Bio-Rad, Hercules, CA). Extraction protocol was followed and after final centrifuging, 1 µl of supernatant was removed and added to a PCR tube containing a PuReTaq Ready-To-Go™ PCR Bead (GE Healthcare, Pittsburgh, PA), 1 µl of 100 µM ITS-1 primer (TCCGTAGGTGAACCTGCGG-3') and 1 µl of 100 µM ITS-4 primer (5'-TCCTCCGCTTATTGATATGC-3') (White et al. 1990), and 22 µl of sterile PCR-grade water for a total reaction volume to 25 µl. PCR reaction was performed in a Thermal Cycler (Mastercycler gradient, Eppendorf, Hamburg, Germany) under the following parameters:

initial denaturation at 94 °C for 5 min; 34 cycles at 94 °C for 1 min; 1 cycle at 53 °C for 1 min; 1 cycle at 72 °C for 1 min; final extension at 72 °C for 5 min; and a 4 °C hold (White et al. 1990). DNA amplification was confirmed using 1.0% agarose gel electrophoresis. Samples were run on the gel alongside a 100 bp ladder (New England Biolabs, Ipswich, MA) and bands with a range of 400 – 600 bp were visualized on a transilluminator. Amplified DNA was purified using a QIAquick Purification Kit (Qiagen, Inc., Valencia, CA) and stored at -20 °C. DNA concentration was measured using a Nanodrop 2000 spectrophotometer (Thermo Fisher Scientific, Waltham, MA) and vacuufuged (Vacufuge plus, Eppendorf) for 45 min. DNA was then resuspended to a concentration of 40 ng/μl and submitted to Eurofins Genomics (Louisville, KY) for sequencing using the ITS1/ITS4 primers. Sequences were manually edited and aligned using Geneious software (Biomatters Ltd., Auckland, New Zealand). Consensus sequences were BLAST analyzed using NCBI GenBank (National Center for Biotechnology Information, Bethesda, MD).

Statistical analysis

Experimental parameter measurements were taken on all plants every seven days after inoculation. Parameter measurements from sub-replicates were averaged and used for statistical analysis. No statistically significant differences in parameter measurements were noted between trials with the exception of infection rate. Root infection rate was less in the September trial than the July trial and it is hypothesized that this is due temperature differences between the two trials. The *P. aphanidermatum* isolate M15D has optimal growth at 35 °C (data not shown), and inoculation occurred before a large spike in temperatures in July while temperatures in September remained relatively cooler. Data from both trials were combined and analyzed utilizing R statistical software (R Foundation for Statistical Computing, Vienna, Austria). All analyses treated trial replicates as a random effect while irrigation and pathogen inoculation were treated as fixed effects. Shoot and root dry weights were analyzed using a two-way analysis of variance (ANOVA) to compare the effects of inoculation and irrigation treatment. Plant quality ratings at 7, 14, 21, and 28 days after inoculation were analyzed utilizing two way repeated measures multivariate analysis of variance (MANOVA). Infection rate, mortality and marketability among irrigation treatments were analyzed using a two-way ANOVA and means separation with Tukey's HSD test to determine differences between treatments.

Goals and Outcomes Achieved

Study I: Implementation of soil moisture sensor-based automated irrigation in woody ornamental production

Goals:

1. Quantify the impact of wireless sensor networks on the growth rate of plants and length of the cropping cycle.
2. Observe the affect on plant quality and marketability when using wireless sensor network controlled irrigation.

Irrigation water use was cut by approximately 50% in both 2014 and 2015 when comparing sensor-based to grower-controlled irrigation (Fig. 1.1). This resulted in a savings of 569,900 gals of irrigation water in 2014 and 2,215,100 gals in 2015, roughly the annual water usage of 19 family homes in the U.S. (EPA, 2016). Comparative *Pieris japonica* growth indexes were observed between irrigation treatments in both 2014 and 2015 (Fig. 1.2). In 2014 2% *Pieris japonica* mortality was noted in both irrigation treatments. In 2015 the grower irrigated *Pieris japonica* again experienced a 2% mortality rate compared to 1% in the sensor-based irrigation section. *Hydrangea quercifolia* had comparative growth indexes in 2014 during which time the grower irrigated section had a higher mortality rate (18%) compared to the sensor-based section (4%). Declining growth indexes were observed in 2014 as the plants began to harden off and defoliate for winter. In 2015 a late frost compromised the quality and vitality of all of the *Hydrangea quercifolia* used in the study. The decision was made by the nursery owner to discard the entirety of the crop in late August as it was not judged to be salvageable for market. Before the crop was discarded in 2015 the grower controlled section produced *Hydrangeas* with larger growth indexes ($p = 0.03$) averaging $106,720 \pm 10,661 \text{ cm}^3 (\pm \text{SE})$ while *Hydrangeas* produced with sensor-based irrigation averaged $69,926 \pm 8,623 \text{ cm}^3 (\pm \text{SE})$. *Hydrangea* losses before discarding of the crop in 2015 were greater in the grower section with 12% mortality observed compared to 10% mortality in the sensor-based section. Growth indexes of *Kalmia latifolia* in 2014 were greater in plants irrigated with sensor-based irrigation ($p < 0.01$). However, this observation is hypothesized to be an artifact of selection from the grower irrigated section to accommodate end of year sales at the nursery. *Kalmia latifolia* grown in 2015 with sensor-based irrigation had larger growth indexes ($p = 0.04$) averaging $191,994 \pm 7,414 \text{ cm}^3 (\pm \text{SE})$ by the end of the trial while grower irrigated plants averaged $168,554 \pm 9,285 \text{ cm}^3 (\pm \text{SE})$. *Kalmia latifolia* mortality was less than 1% in 2014 in both irrigation treatments. Mortality was again less than 1% in the sensor controlled irrigation section in 2015, however the grower irrigated *Kalmia* experienced an 8% crop loss. In 2014 *Rhododendron catawbiense* had equivalent growth indexes and higher mortality in the grower section (3%) when compared to the sensor-based section (0%). However, in 2015 greater than 50% mortality was noted in the sensor-based irrigation by the end of the production cycle (Fig. 1.2). High mortality in the crop was thought to be the result of persistent drought stress that was observed in the *Rhododendron* irrigated with sensor-based irrigation throughout most of the 2015 trial. Water capture from overhead irrigation application is inversely related to leaf area and canopy density (Beeson and Knox, 1991; Beeson and Yeager, 2003). We hypothesize that while observationally both the *Pieris* and *Kalmia* had high canopy densities, we believe leaf orientation may have channeled water towards the root ball creating conditions of greater irrigation water capture. This same channeling quality was also observed in the leaf orientation of the *Hydrangea*, which also appeared to have the greatest leaf area but the lowest canopy density. In contrast, the *Rhododendron*, based on casual observation combined relatively large leaf areas with high canopy densities that extended beyond the diameter of the container and leaf orientation that tended to shed water away from the root ball. It is hypothesized that this canopy structure reduced the amount of water reaching the roots. We hypothesize that while canopy structure helped create conditions that reduced irrigation water capture within the *Rhododendron*, the use of averaged soil moisture sensor readings to trigger irrigation allowed

for drought conditions to persist (Fig. 1.3). Soil moisture readings for August of 2015 averaged $48.84 \pm 0.26 \text{ m}^3 \cdot \text{m}^{-3}$ ($\pm \text{SE}$) for *Pieris*, $42.08 \pm 0.08 \text{ m}^3 \cdot \text{m}^{-3}$ for *Kalmia*, and $28.18 \pm 0.17 \text{ m}^3 \cdot \text{m}^{-3}$ for *Hydrangea*. Comparatively sensor readings averaged 17.47 ± 0.05 and $15.99 \pm 0.04 \text{ m}^3 \cdot \text{m}^{-3}$ for the two sensors monitoring the *Rhododendron* crop. These values suggest *Pieris*, *Kalmia*, and *Hydrangea* were maintained at adequate or luxury soil moisture levels while *Rhododendron* were under persistent drought stress. In addition, *Rhododendron*, with the largest canopy volumes (Fig. 1.2), are thought to have had higher transpiration rates and daily water use requirements than the other three species. We hypothesize that these combined factors created drought conditions that contributed to the higher mortality numbers seen in 2015. Fernandez et al. (2009) recommend grouping nursery crop species by their daily water use requirements for maximization of water use efficiency while minimizing overwatering. Grower managed irrigation at this nursery had previously allowed for grouping of the four species used in the study and it is hypothesized that plants were able to adapt to high irrigation volumes. Greater precision irrigation applications afforded by the sensor-based irrigation system may mean reworking traditional irrigation groupings employed at the nursery and take greater account of daily water use and water use efficiencies.

Grower adoption

Ownership of the nursery was transferred from one generation to the next within the same family in August of 2014. Experiments continued through the transfer with the consent of the new owner. However, the challenges of new ownership meant that there was less interaction with Extension efforts and diverted interest in the trials by upper management at the nursery. High mortality numbers in the *Rhododendron* crop produced with sensor-based irrigation generated concern from the new owner and head grower about the ability of the system to meet plant water needs and flush accumulated salts from the media. No significant differences were noted in electrical conductivity readings between sensor-based and grower irrigated *Rhododendron* in 2014 ($p = 0.84$) though they were significant in 2015 ($p < 0.01$) (Fig. 1.4). However, readings in both irrigation treatments in 2015 were not observed above 2.0 mS cm^{-1} , levels not typically sufficient to generate crop damage (Fornes et al., 2007). While the system did face challenges meeting the water needs of the *Rhododendron* in 2015, we believe this could have been avoided with greater understanding, experience, and involvement of the grower or section grower with the system. A number of preventative measures could have been undertaken such as re-positioning the sensors, increasing irrigation set points, or sending manual irrigation commands to address the disparities in water usage. Additional challenges to grower adoption that occurred over the course of the study involved the dynamic of irrigation management that evolved as a result of access and understanding of system by nursery staff. The head grower and owner received training on how to make irrigation changes with the sensor-based system and had access to the computer station in the central office. Experimental plots however were managed primarily by the section grower, who did not have training or access to the Sensorweb software, and could not make changes to the system. Any necessary changes to irrigation set points were made by the researcher after semi-structured interviews with the section grower and head grower about the performance of sensor-based irrigation system. However, this dynamic limited the functionality of the system and ultimately may have

hindered adoption of the technology. Ultimately this arrangement was closer to those employed in previous studies in which researchers controlled irrigation set points. This also may have contributed to the mortality observed in the *Rhododendron* in 2015 as the person who had the greatest interaction with the experimental plot also had the least control over the system.

Study II: *Sensor-based automated irrigation impacts Pythium aphanidermatum infection in Petunia × hybrid*

Goal:

1. Quantify reductions in disease incidence and severity as well as crop losses due to disease resulting from use of wireless sensor networks.

Root infection and mortality

Root infection and whole plant mortality were noted only in inoculated treatments. Within inoculated treatments, plants maintained at a θ of 0.2 m³•m⁻³ had average root infection rates of 16.25 ± 4.30% (SE). This was significantly lower than plants maintained at 0.4 m³•m⁻³ ($p = 0.02$) and under cyclic θ ($p = 0.03$) that had infection rates of 30.00 ± 10.30% and 29.19 ± 9.70%, respectively (Fig. 2.2). The root infection rates of plants grown at consistent θ of 0.3 m³•m⁻³ was 21.25 ± 6.40%, which did not differ from infection rates in any other treatment. Differences in plant mortality, while not significant ($p = 0.88$), had the opposite trend seen for root infection. Inoculated plants grown at 0.2, 0.3, and 0.4 m³•m⁻³ incurred 28.1 ± 10.00%, 25.0 ± 9.40%, 25 ± 6.70%, mortality respectively, while inoculated plants grown with cyclic irrigation incurred 18.8 ± 6.30% mortality. Consequently, there was no correlation between infection rate and plant mortality ($p = 0.19$).

Dry weight

Inoculation with *P. aphanidermatum* reduced dry root and shoot weight ($p < 0.01$) across all irrigation treatments by an average of 2.37 ± 0.79 g and 2.50 ± 0.29 g, respectively (Fig. 2.3). No interactive effect between irrigation treatment and inoculation was noted in either root ($p = 0.29$) or shoot ($p = 0.72$) dry weight. Irrigation treatments had no effect on dry root weights within the uninoculated ($p = 0.90$) and inoculated treatments ($p = 0.76$). Dry root weights ranged from 6.70 ± 1.47 g to 8.34 ± 1.95 g in the uninoculated treatments and 4.17 ± 0.79 g to 5.82 ± 1.32 g in the inoculated treatments. Similarly shoot dry weight was unaffected by irrigation treatment in both the uninoculated ($p = 0.56$) and inoculated treatments ($p = 0.54$). Dry shoot weights ranged from 8.99 ± 0.98 g to 10.99 ± 1.30 g in the uninoculated treatments, and from 6.36 ± 0.61 g to 7.80 ± 0.85 g in inoculated treatments.

Plant quality

Inoculation with *P. aphanidermatum* caused a reduction of plant quality over time in all irrigation treatments ($p < 0.01$). The average plant quality ratings at the completion of both trials ranged from 3.31 ± 0.40 to 3.69 ± 0.35 in inoculated treatments and 4.44 ± 0.16 to 4.94 ± 0.04 in Uninoculated treatments. (Table 2.1). Irrigation treatments did not differ in their ability

to mitigate reductions in overall quality caused by inoculation ($p = 0.76$). Within both the uninoculated ($p = 0.17$) and inoculated ($p = 0.88$) treatments plant quality did not differ as a result of irrigation treatments. No interactive effects were noted between irrigation treatment and inoculation ($p = 0.70$).

Marketability

Across all treatments inoculation with *P. aphanidermatum* reduced the average probability of producing a marketable crop by $27 \pm 11\%$ ($\pm SE$) ($p < 0.01$) (Fig. 2.4). Irrigation treatments were not effective at mitigating the reduction in marketability caused by inoculation ($p = 0.74$). No interactive effects were noted between irrigation and inoculation treatments ($p = 0.96$). In uninoculated treatments, irrigation regime had no effect on marketability with 0.2, 0.3, 0.4 m³•m⁻³ and cyclic θ having $93.75 \pm 6.25\%$, $96.88 \pm 3.13\%$, $100.00 \pm 0.00\%$, and $93.75 \pm 4.09\%$ probability of producing plants greater than the marketable threshold. In inoculated treatments, no differences in marketability were noted in plants grown at 0.2, 0.3, 0.4 m³•m⁻³ and cyclic θ which produced $62.50 \pm 10.56\%$, $71.88 \pm 9.95\%$, $71.88 \pm 8.76\%$, and $68.75 \pm 10.30\%$ of plants above the marketable threshold.

Beneficiaries

Study I: Implementation of soil moisture sensor-based automated irrigation in woody ornamental production

- Commercial ornamental producers looking to substantially reduce farm-wide irrigation use.
- Commercial growers not dissuaded by early adoption of technology.
- Commercial growers in water-limited regions and/or in significant drought years.
- GA Department of Agriculture, as this technology demonstrated the technological capability to significantly reduce irrigation volumes by using relatively inexpensive technology (less than \$5,000 investment/farm for a base system).

Water use when implementing a soil-moisture based precision irrigation system at Transplant Nursery was 50%, which is in-line with other studies performed in the last decade (Chappell et al., 2013). However, with some growers who are technology-averse/reluctant, greater education and experience are needed to increase the likelihood of early adoption. Scale of production also has an impact, with greater opportunity costs associated with larger scales of production (Wozniak, 1987). Interviews with Transplant Nurseries' owner and head grower suggest that they were unlikely to adopt technology during the earliest stages of diffusion, and in many cases preferred to avoid automation in general, as it in their view promoted neglect of routine maintenance. Growers also commented that reductions in irrigation water usage were not a management priority given the accessibility in non-drought years and low cost of water regionally. It should be noted that the years when this study were conducted were at or above normal rainfall. This and other growers are suddenly very interested as of fall 2017, with the

intense drought that has emerged. In the case of this study, interest in the system was initiated with the previous owner and related to a lack of well-trained irrigators at the facility and the potential to reduce crop losses. The transfer of ownership early in the study reduced the institutional experience and introduced a great deal of volatility within the organization. Transfer of ownership also limited availability and access to upper management, which in turn limited education and outreach opportunities to facilitate technology transfer. Shortfalls in technology transfer, coupled with initial challenges associated with inappropriate irrigation grouping, increased resistance to early adoption. Nonetheless, even with these challenges, grower-based irrigation management decisions using the precision irrigation system yielded water savings of approximately 50%.

This study demonstrates the need of sustained grower interest and education to overcome the perceived risks of new technology and ensure its successful adoption. Equally important is ensuring proper access and training are provided ultimate end user of the system and consideration is given to how institutional organization of labor management might impact the viability of implementation. Incentives to adopt precision irrigation systems may come in the future in the forms of greater regulation associated with water management or from environmental pressures in the form of drought. However, at present the reductions in irrigation water usage alone, coupled with the perceived risks of implementing precision irrigation through soil moisture sensing have limited adoption at this facility. Adoption of novel technology will ultimately depend on the individual institution and whether risks and costs associated with new technology out weight the perceived benefits.

Study II: *Sensor-based automated irrigation impacts *Pythium aphanidermatum* infection in *Petunia* × *hybrid**

- Commercial growers attempting to reduce disease incidence and/or severity while reducing or eliminating pesticide usage.
- Commercial growers attempting to limit pathogen spread (secondary infections) within a crop once primary infection had been seen.
- Commercial growers wanting to implement cultural mechanisms for disease control to limit fungicide resistant pathogens.

Use of sensor-based automated irrigation systems has previously been shown to accurately control irrigation, reduce water usage, minimize crop shrinkage, and shorten the cropping cycle of nursery and floriculture crops (Chappell et al., 2012; Belayneh et al., 2013; Chappell et al., 2013). In this study, we sought to explore the relationship between precise irrigation control afforded by these systems and the incidence and severity of infection by *Pythium aphanidermatum* in an inoculated crop. Previous research has shown that both abundant soil moisture and cyclic drying and wetting of substrate can promote root pathogen proliferation, growth and subsequent primary and secondary infections (Blaker and MacDonald, 1981; Martin and Loper, 1999). Conversely, *P. aphanidermatum* oospore germination and germ tube growth is reduced in consistently dry soil conditions (Stanghellini and Burr, 1973). Based on these previous studies, we hypothesized that by maintaining dry root zone conditions with

recently developed automated irrigation technology, it would be possible to inhibit *P. aphanidermatum* growth and oospore germination. Data indicated that in inoculated treatments, by maintaining a consistently dry root zone ($0.2 \text{ m}^3 \cdot \text{m}^{-3}$), root infection was reduced when compared to substrates maintained near saturation ($0.4 \text{ m}^3 \cdot \text{m}^{-3}$) and those undergoing cyclic wetting and drying ($0.18 - 0.43 \text{ m}^3 \cdot \text{m}^{-3}$). This is consistent with other research that showed disease incidence in soybean (*Glycine max* [L.] Merr.) correlated to the number of days with high soil water matric potential (Schlub and Lockwood, 1981). It is also consistent with findings of increased root necrosis caused by *Pythium* spp. on holly (*Illex crenata* var. *helleri*) grown with cyclic soil water availability (Biesbrock and Hendrix Jr, 1970). However, a reduction in root infection rates did not correspond to a decrease in plant mortality, which averaged $24 \pm 8\%$ over all inoculated irrigation treatments in this study (Fig. 2.2).

Within the inoculated treatments, the driest irrigation regime ($0.2 \text{ m}^3 \cdot \text{m}^{-3}$) led to an overall reduction in infection rate in the root system, likely as a result of mitigating secondary infection. However, the combination of drought stress and pathogen presence likely contributed to crop mortality in the driest treatment in this study. The inoculation method used could account for this result. To ensure infection, all treatments were irrigated to near field capacity following inoculation. Doing so ensured the pathogen's distribution from the vermiculite carrier into the soil column. This likely led to primary infection of plants in all irrigation regimes. In the driest treatment, where plants were under water stress, the combined pressure of primary *P. aphanidermatum* infection degrading the root system and drought stress may have led to higher levels of plant mortality than expected similar to results summarized by Schoeneweiss (1978). This resulted in no notable difference in mortality between cyclic or steady state soil moisture profiles in inoculated treatments.

While these results are somewhat confounding, focusing on the combination of growth and infection rates between inoculated and uninoculated treatments points to the potential for reduced secondary infection in the driest irrigation treatment ($0.2 \text{ m}^3 \cdot \text{m}^{-3}$), while maintaining similar growth rate and quality regardless of θ . Implementation of consistently dry rooting substrates before the introduction of the pathogen could disrupt its establishment, a fact that is alluded to in reduced secondary infection witnessed in the current study at the lowest θ ($0.2 \text{ m}^3 \cdot \text{m}^{-3}$) of inoculated treatments. Looking at uninoculated treatments, the lowest θ ($0.2 \text{ m}^3 \cdot \text{m}^{-3}$) did not impact plant growth compared to higher θ levels. Specifically, no difference in mortality, plant quality, marketability, or biomass among the four irrigation regimes was noted in uninoculated treatments. Concurrently analyzed, a conclusion can be drawn that the best non-chemical method of mitigating pathogen damage in commercial production would combine strict sanitation practices to prevent the introduction of inoculum while maintaining dry root zone conditions to prevent pathogen proliferation and infection. However, even in the presence of inoculum, establishment and infection of root rot pathogens could be mitigated by growing at a low θ , as seen in the θ treatment of $0.2 \text{ m}^3 \cdot \text{m}^{-3}$ in this study. The data points to a window of θ in which pathogen germination and subsequent infection is reduced, and yet plant growth is not reduced by drought stress. This window of θ would need to be determined based on soil properties and species grown, however this study indicates that by using recent advances in automated irrigation technology, strict θ control is now feasible for commercial growers that could reduce disease pressure without sacrificing growth and/or quality. Based on

results presented in this study, integrated pest management recommendations could be expanded to include maintaining consistently dry, yet stable θ to prevent the establishment and spread of pathogens. This, combined with sanitation practices, could significantly reduce disease incidence and severity in many floriculture and nursery crops. This study represents the first use of a sensor-based automated irrigation system to reduce root infection and disease development, and should serve as a practical example of an inexpensive means of reducing one of the largest inputs in commercial specialty crop production (fungicides).

Lessons Learned

- Water use can be cut dramatically using soil moisture-based precision irrigation systems, such as those employed in this project.
- Grower adoption of these systems falls into two broad categories:
 - o Early adopters are likely to adopt this technology as a labor-saving or resource-saving mechanism (see Chappell et al., 2013).
 - o Reluctant/late adopters of technology are not likely to adopt this technology, despite the relatively low setup cost, until regulations and/or resource (irrigation water) cost or availability force change.
- Disease spread can be effectively managed using cultural controls, namely irrigation management, to reduce or eliminate root-rot primary infection and subsequent secondary infections. This is significant in that this is the first study to demonstrate this capability using a grower-available irrigation controller system. *Until now, only lab-based systems have shown this capability.*
- Significant grower education and outreach (Extension-based activities) would be required to educate growers on the benefits of the system, to achieve widespread adoption.

Contact Person

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Additional Information

Tables & Figures

Figure 1.1 - Cumulative irrigation water usage in 2014 and 2015 for a soil moisture sensor-based automated irrigation system compared to grower managed irrigation. In 2014 trials were initiated on 25 - Aug - 2014 and continued through 14 - Nov. - 2014 when irrigation lines were drained for the winter. The following year trials were initiated on 23 - April - 2015 and completed on 11 - Nov. - 2015.

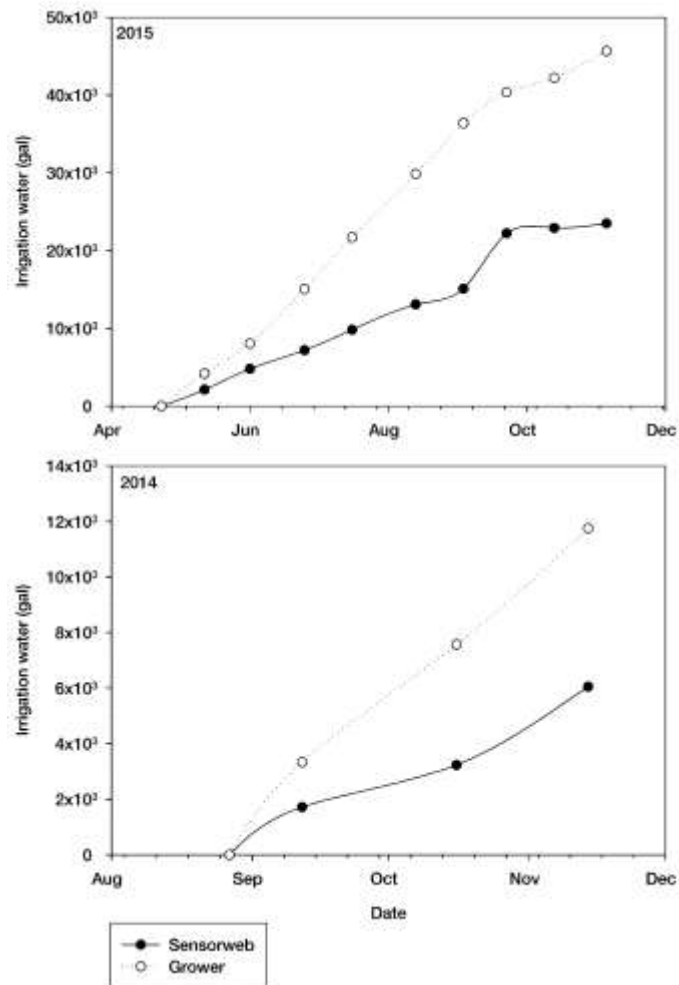


Figure 1.2 - Comparative growth indexes and mortality rates for four crops produced with grower managed irrigation and a soil moisture sensor-based automated irrigation system. Averaged distributed soil moisture readings were used to trigger irrigation events with the sensor-based irrigation system.

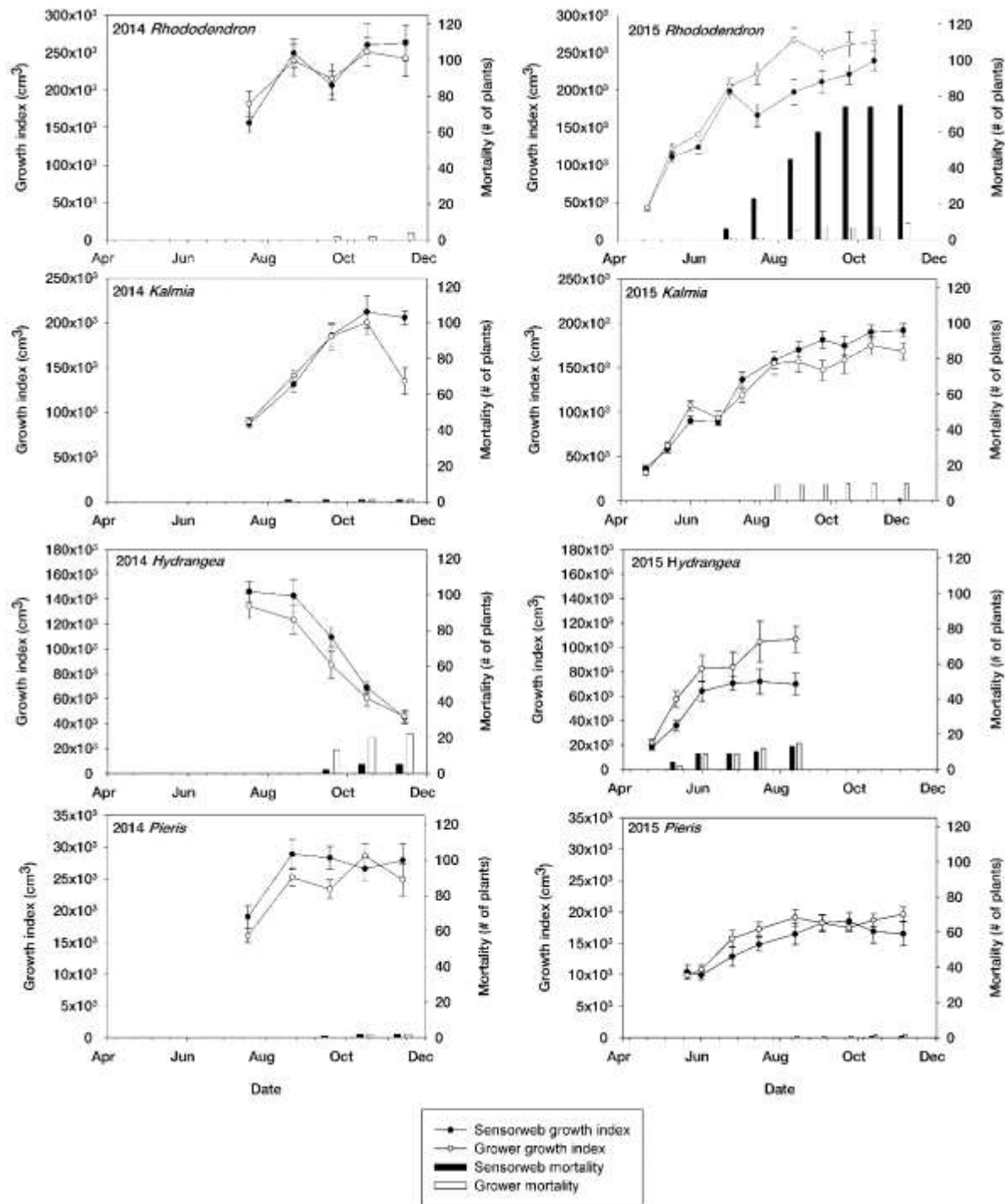


Figure 1.3 - Select soil moisture readings from a soil moisture sensor-based automated irrigation system. High mortality numbers in the Rhododendron were noted in the sensor-based irrigation block. It is thought that the Rhododendron were under persistent drought stress due to inappropriate irrigation groupings with greater precision irrigation application employed by

the sensor-based system. Canopy structure of the *Rhododendron* was such that it shed irrigation water away from the root ball, while other species within the irrigation grouping had canopies which allowed for greater overhead irrigation water capture. Averaged irrigation thresholds were used to trigger irrigation events, which allowed for the *Rhododendron* to be maintained under drought conditions while the other three species in the study were maintained at adequate or luxury water consumption irrigation application rates.

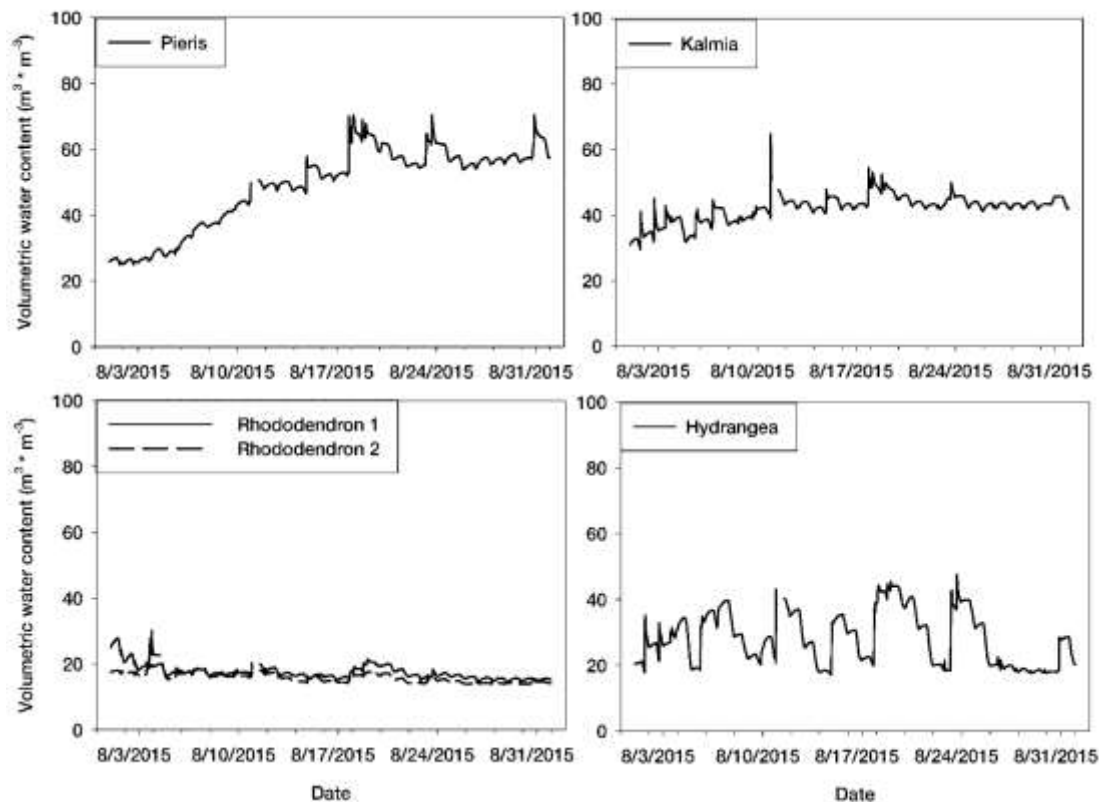


Figure 1.4 - Discrete electrical conductivity readings using a HH2 WET2 meter from *Rhododendron catawbiense* 'Roseum Elegans' grown using a soil moisture sensor-based automated irrigation system and grower managed irrigation.

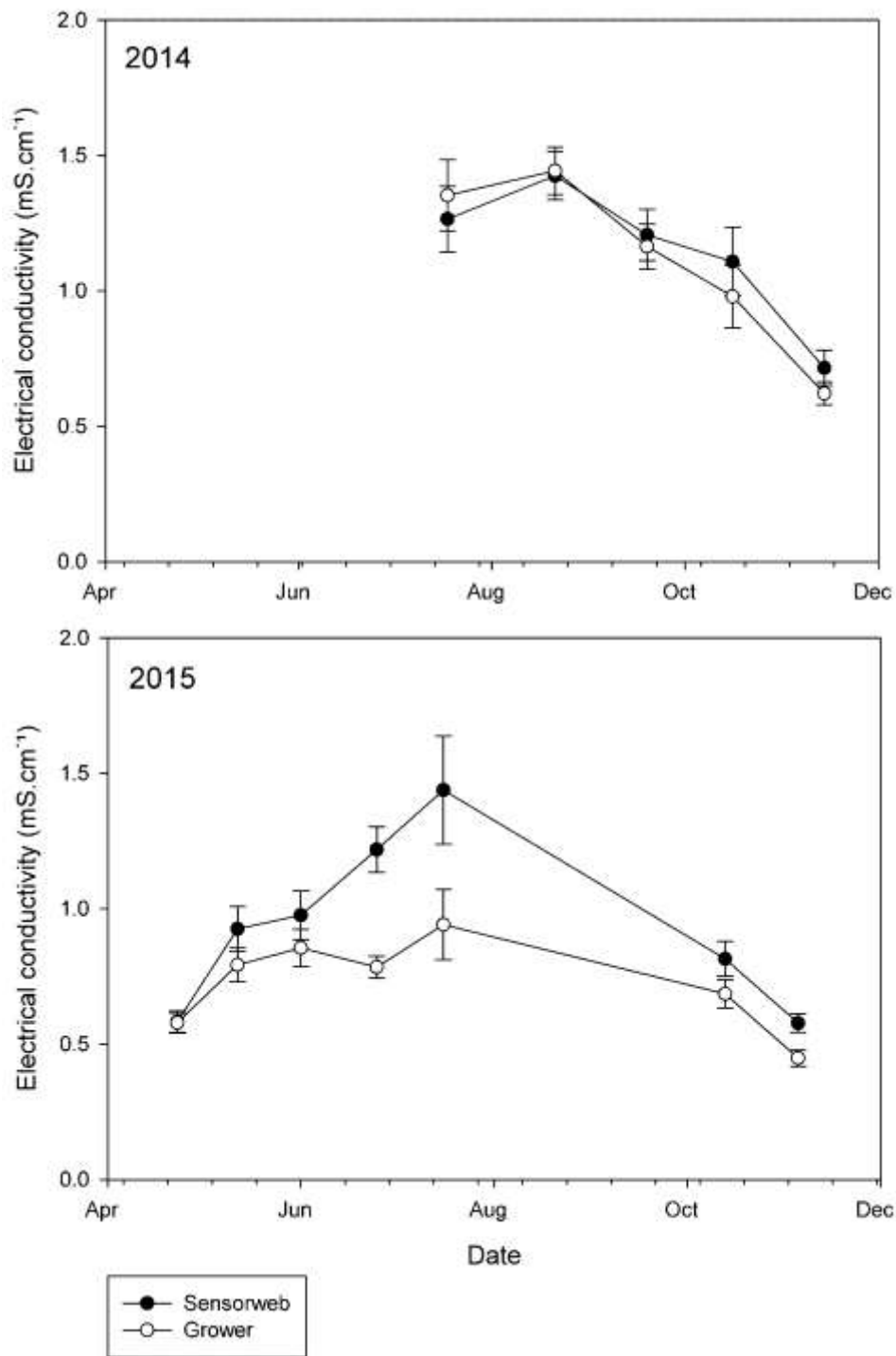


Figure 2.1 - Soil moisture sensor readings over a 12-day period from 19 Jul 2015 to 30 Jul 2015 for a sensor-based automated irrigation system. The sensor-based automated irrigation system maintained substrate volumetric water content (VWC) at 0.2, 0.3, and 0.4 m³•m⁻³ as well as

creating a cyclic soil moisture profile, allowing irrigation to dry down to $0.18 \text{ m}^3 \cdot \text{m}^{-3}$ before irrigating to $0.43 \text{ m}^3 \cdot \text{m}^{-3}$. The automated irrigation system received readings from soil moisture sensors every 10 s and opened or closed the corresponding solenoid valve depending if readings fell above or below the programmed threshold.

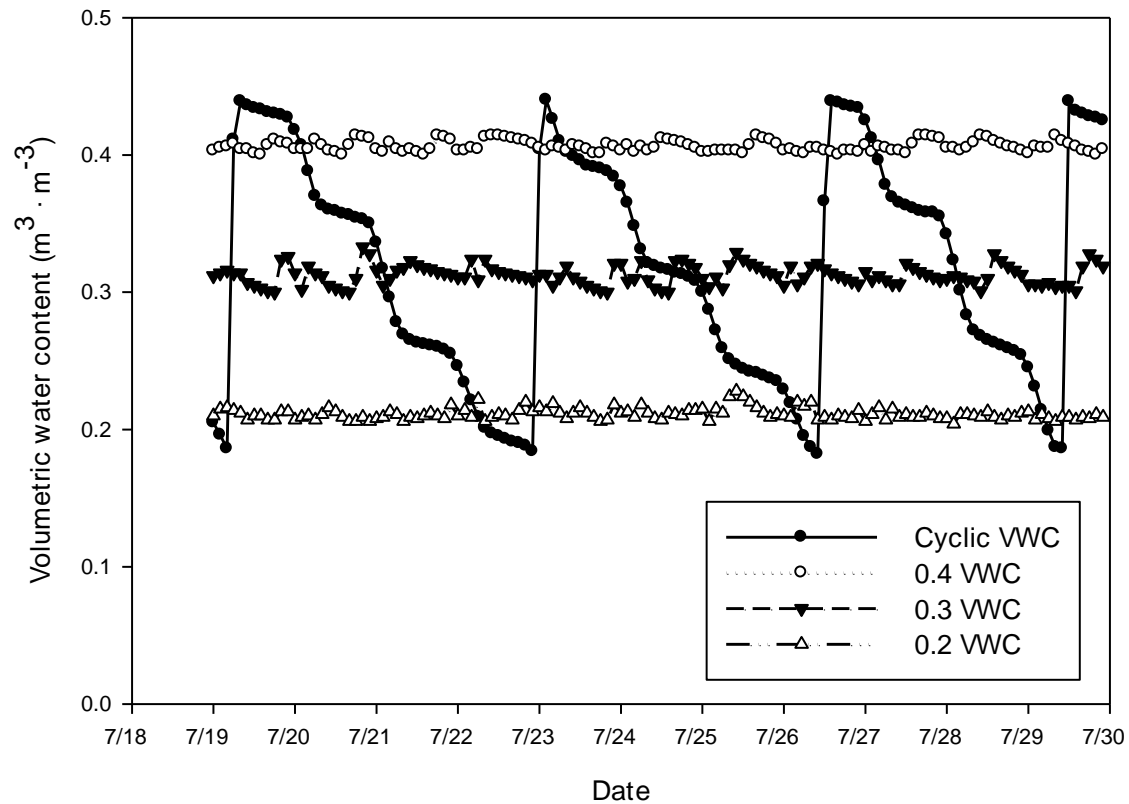


Figure 2.2 - *Pythium aphanidermatum* root infection rate (A) and plant mortality (B) in inoculated *Petunia × hybrida* 'Dreams Red' irrigation treatments. Plants maintained at consistently dry ($0.2 \text{ m}^3 \cdot \text{m}^{-3}$) soil moisture contents had reduced probability of infection

compared to those maintained at near saturation ($0.4 \text{ m}^3 \cdot \text{m}^{-3}$) ($p = 0.02$) and those grown with cyclic ($p = 0.03$) soil moisture profiles. Plants grown under consistently moist root zone conditions ($0.3 \text{ m}^3 \cdot \text{m}^{-3}$) did not differ in probability of root infection from any of the other irrigation treatments. Plants grown at consistent soil moisture profiles ($0.2, 0.3, 0.4 \text{ m}^3 \cdot \text{m}^{-3}$) and those undergoing cyclic change (0.18 to $0.43 \text{ m}^3 \cdot \text{m}^{-3}$) had no significant differences ($p = 0.88$) in mortality rate when inoculated.

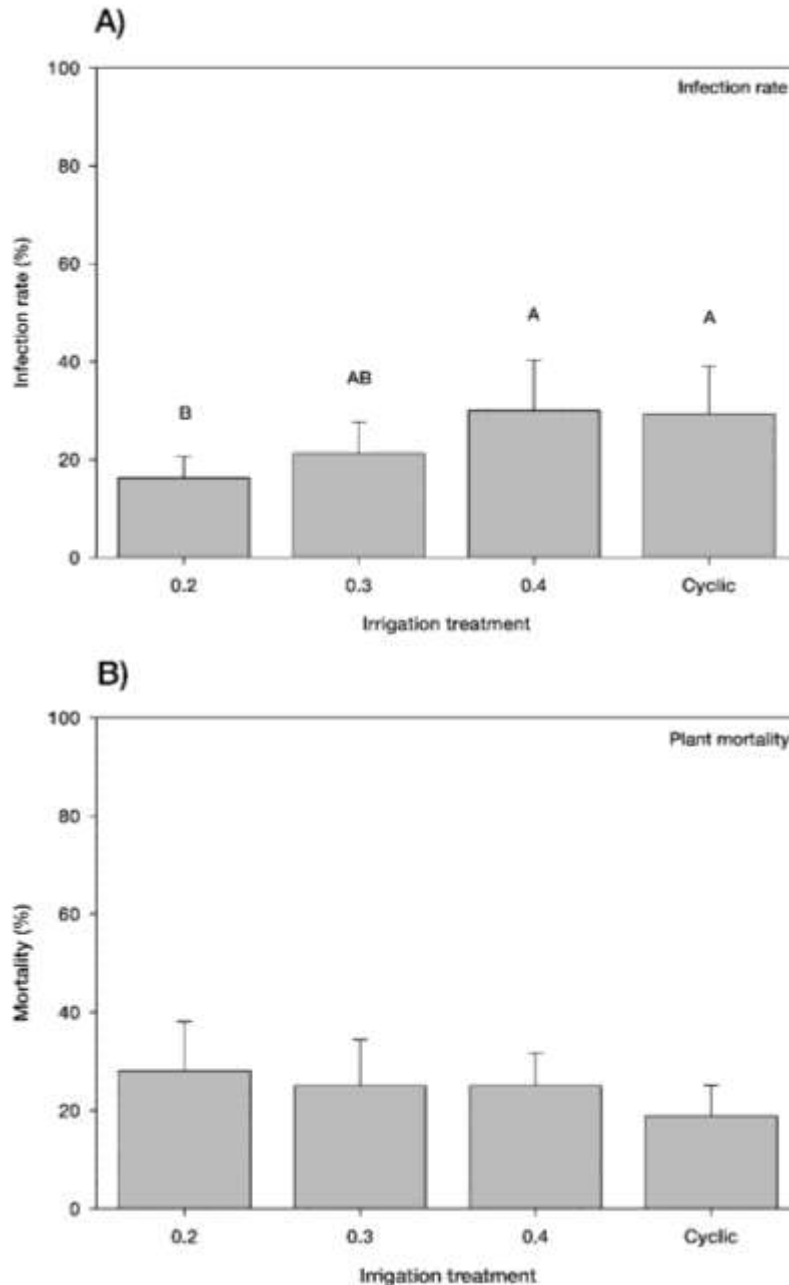


Figure 2.3 - Shoot (a) and root (b) dry weights of *Petunia x hybrida* 'Dreams Red' in uninoculated and inoculated treatments (with *Pythium aphanidermatum*). Soil moisture sensor-

based automated irrigation was used to control irrigation at constant (0.2, 0.3, 0.4 m³•m⁻³) and cyclic (0.18 to 0.43 m³•m⁻³) volumetric water contents. Irrigation treatments inoculated with *P. aphanidermatum* experienced a reduction in both root and shoot dry weights ($p < 0.01$). Plants grown at consistent soil moisture profiles and those undergoing cyclic change had no significant differences in dry shoot or root weights in both uninoculated and inoculated treatments.

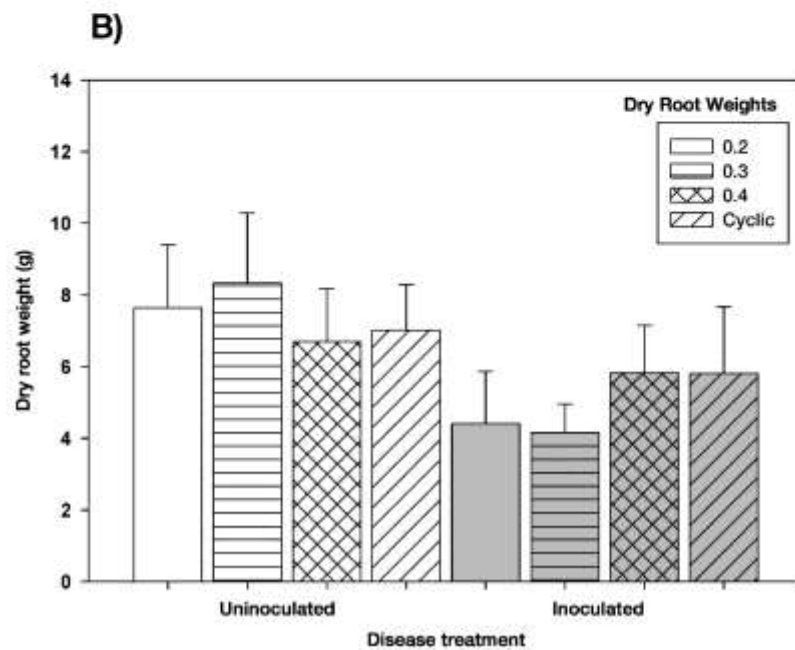
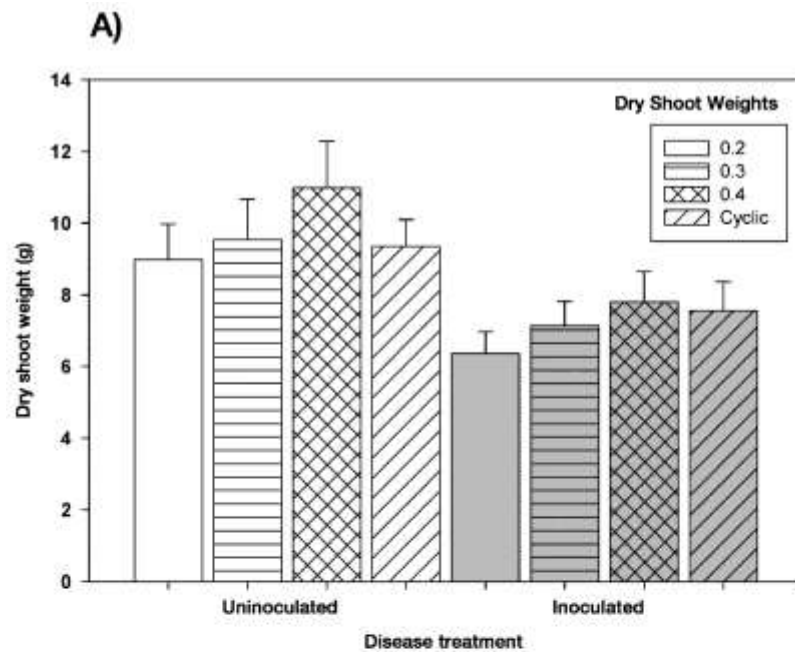


Figure 2.4 - Marketability of *Petunia* × hybrida 'Dreams Red' was reduced by inoculation with *Pythium aphanidermatum*. Marketable crops were those judged to have a plant quality rating of 4 or 5 on a standardized 1 to 5 scale at the end of the experiment, where 1 = a dead plant and 5 = a vigorously growing plant with good foliar tone. Irrigation was maintained at multiple steady state (0.2, 0.3, 0.4 m³•m⁻³) and one cyclic (0.18 to 0.43 m³•m⁻³) volumetric water contents had no effect at mitigating marketability losses due to disease. Probability of producing a marketable crop was unaffected in both uninoculated ($p = 0.66$) and inoculated ($p = 0.90$) treatments by the different irrigation regimes.

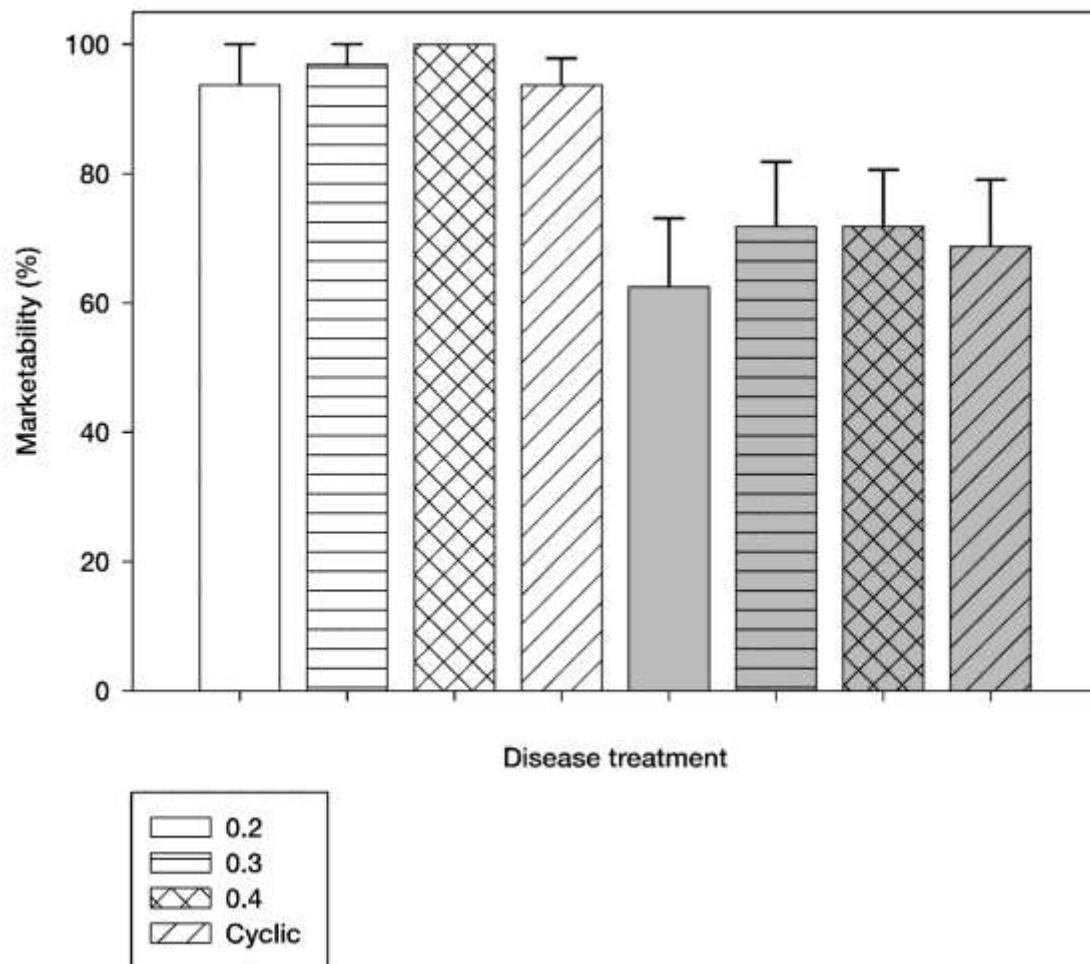


Table 2.1. Average plant quality ratings for *Petunia* × *hybrida* ‘Dreams Red’ at 7, 14, 21, and 28 days after inoculation with *Pythium aphanidermatum*. Plants were grown at three consistent soil moisture profiles (0.2, 0.3, 0.4 m³•m⁻³) and one undergoing cyclic change (0.18 to 0.43 m³•m⁻³).

Average Plant Quality Over Time					
Irrigation Treatment (VWC)	Disease Treatment	Plant Quality Rating ¹			
		7 dai ²	14 dai	21 dai	28 dai
0.2	Uninoculated	4.91 ± 0.07 ^a	4.91 ± 0.07 ^a	4.81 ± 0.09 ^{ab}	4.44 ± 0.16 ^{ab}
0.3	Uninoculated	4.84 ± 0.08 ^a	4.91 ± 0.09 ^a	4.81 ± 0.08 ^{ab}	4.72 ± 0.07 ^{ab}
0.4	Uninoculated	4.94 ± 0.04 ^a	4.94 ± 0.06 ^a	4.94 ± 0.04 ^a	4.94 ± 0.04 ^a
Cyclic	Uninoculated	4.91 ± 0.05 ^a	4.97 ± 0.03 ^a	4.81 ± 0.06 ^a	4.72 ± 0.10 ^{ab}
0.2	Inoculated	4.91 ± 0.05 ^a	3.78 ± 0.45 ^b	3.34 ± 0.42 ^c	3.31 ± 0.40 ^c
0.3	Inoculated	4.88 ± 0.07 ^a	4.06 ± 0.27 ^a	3.81 ± 0.36 ^{bc}	3.59 ± 0.33 ^{bc}
0.4	Inoculated	4.91 ± 0.05 ^a	3.97 ± 0.25 ^a	3.78 ± 0.25 ^{bc}	3.47 ± 0.29 ^{bc}
Cyclic	Inoculated	4.84 ± 0.07 ^a	4.41 ± 0.28 ^a	3.78 ± 0.34 ^{bc}	3.69 ± 0.35 ^{bc}

¹ Plant quality rating based on a 1 to 5 scale, where = 1 a dead plant and 5 = a vigorously growing plant with good foliar tone.

² dai = days after inoculation

16). UGA- Product Development: Phase III Sustainable Turfgrass and Water Conservation Final Performance Report

Project Summary

This project targeted the entire turfgrass production, installation, and maintenance chain, all components of which are integral in establishing a sustainable, low input turfgrass product. Consumers desire sustainable Turfgrass, as it is easier to maintain, looks attractive, and reduces runoff. The development of a sustainable product is critical to the growth of the turfgrass industry in Georgia. Only sustainable turfgrass can ensure the environmental and aesthetic benefits that consumers demand of turfgrass. The objectives of this study were to: 1) assure and promote the environmental benefits of sustainable turfgrass by educating sod producers, landscape industry workers, and County Extension Agents in turfgrass Best Management Practices (BMPs: proper turfgrass variety selection, soil preparation, installation, and maintenance); 2) determine the impacts of increased soil organic matter on turfgrass water use, and on insect, disease, and weed pests; and 3) assess the impact of increasing soil organic matter on the economics of the WaterSense New Home Construction Certification Program.

Project Approach

Activities Performed:		
Phase 3. Program Associate does 2 Sustainable Turfgrass trainings working with County Agents, GCLP, and UAC to recruit participants.	Bauske and Woodworth	Completed
Phase 3. 20 Extension agents are trained in sustainable Turfgrass.	Waltz	Completed
Phase 3. Soil samples collected in Phase 2 are analyzed; roots are washed, dried and weighed. Data entered and analyzed.	Waltz	Completed
Phase 3. Preliminary model developed for costs associated with WaterSense New Home Construction.	Bauske and Nguyen	Completed
Phase 3. Field tests irrigated, turfgrass health assessed, digital green color index assessed, soil and	Waltz	Completed

root samples taken.		
Phase 3. Soil samples collected are analyzed; roots are washed, dried and weighed Data entered and analyzed.	Waltz	Completed
Phase 3. Final report on Organic Matter Study published.	Waltz	Completed
Phase 3. Final report on Organic Matter incorporated into the economic analysis of WaterSense BMPs, builder incentives, and homeowner water savings.	Bauske, Nguyen, and Waltz	Completed

Goals and Outcomes Achieved:

Goal 1: In Phase 3, we continued worker training and agent support training through Oct. 30, 2015. This allowed for the training of agents and workers during the off-season and allowed training of newly hired landscape workers in the spring of 2015.

Outcome: The total number of workers trained on this project was 2,328. Pre- to post-training knowledge evaluations improved by an average of 30% for these workers. In addition, supervisors and business owners noted other measurable benefits of the training. After going through training, several groups decided to sharpen their lawn mower blades more often. Two groups planned on calibrating mowers to make sure mowing heights were adjusted to each turfgrass species. Another company used the training to teach their employees to change damaged irrigation sprinkler heads; this freed up supervisors for other duties. Business owners and supervisors frequently asked us for additional training. Verbal feedback was very strong. One owner noted, “Everyone commented on how informative this session was and really felt that they gained a lot of knowledge.”

Seventy-eight agents attended the 2014 Turfgrass Research Field Day on the UGA Griffin Campus. The program lasted 4.5 hours and covered turf breeding, weed control, insect control, and disease control. The field trial funded by this project, *Sustainability of turfgrass with soil incorporation of organic matter*, was highlighted in the afternoon walking tour.

UGA Agriculture and Natural Resource agents were also trained in three hour-long venues (two district updates and one Center for Urban Agriculture update). There were a total of 72 participants in these sessions. We administered 150 agent/training hours in Phase III.

Because of their influence on the turfgrass industry, we also reached out to homeowners and other turfgrass consumers in this project. An Extension publication was created to help homeowners appropriately apply fertilizer to their lawns, thereby avoiding water-contamination. A press publication on lawn water conservation was also created. Finally, a guide was produced to help homeowners and businesses select an irrigation contractor, stressing the favorable economics of water conservation. Two of these reports are available online at the UGA Extension web site and will help people for years to come.

Griffin, B. and C. Waltz. 2015. Turfgrass Fertility: Understanding Labels, N, P, & K, and Micronutrients. UGA Extension Circular (Circular 1058-2).

Waltz, C. 2015. Water Conservation for Home Lawns. Water Saver – Publication of the Cobb Co. Water System. Summer 2015 edition.

Bauske, E. M., G.L. Hawkins, and T. Hurt. 2014. Choosing and a landscape irrigation contractor. UGA Extension Circular (Circular 1056).

Goal 2: Assess the impact of organic matter on turfgrass sustainability.

Outcome: We have completed this goal as well. This field study was conducted from 2013-2015. In it, we were able to establish three dry-down cycles in 2013 and four in 2015 that created water deficits. The weather did not cooperate in 2015 (timely precipitation events prevented drought stress). This study indicated that the incorporation of compost into the upper 10-cm of soil prior to establishment of warm-season grasses can improve water holding capacity, providing a soil reservoir of water. Both composts were associated with increased soil volumetric water content. This increased capacity can aid in reducing the need for supplemental irrigations between rainfall events. No differences were detected in either turf quality or soil volumetric water between the two compost sources tested. No visual differences in turfgrass quality were detected among any soil treatments. The composts did not affect weeds or diseases in this test, though studies incorporating compost into the turfgrass canopy (previously reported in Phase 1 of this project) established that compost provided improved turfgrass color and quality and reduced incidence of the disease dollar spot (*Sclerotinia homoeocarpa*).

The results of the study have been orally presented at these venues:

February 16, 2015. Ga. Park and Recreation Association: Management and Maintenance Annual Meeting (Griffin, GA) – *Sustainable Turf* – 2 hours – 40 practitioners.

February 27, 2015. Ga. Board of Regents Campus and Program Review (Griffin, GA) – *Overview of Turfgrass Programs and Research* – 1 hour – 8 Regents.

July 14, 2015. Turfgrass Water Conservation Alliance Meeting & Purdue University Turfgrass Field Day (West Lafayette, IN) – *A BMPs Approach to Water Conservation* – 1-hour – 50 practitioners.

Dr. Waltz also discussed the field research results with industry practitioners in the private sector at eight green industry/Extension meetings throughout the state, reaching 392 people.

August 12-14, 2015 – Peachtree City, Burnswick, Savannah GA. 152 practitioners.

Nov. 6-10, 2015 - Newnan and Augusta, GA. 60 practitioners.

Dec. 8-10, 2015. Athens and Duluth, GA. 120 practitioners.

Feb. 4, 2016. Tifton, GA. 60 practitioners.

The results of this study have also been published in two publications. Preliminary results were published in the 2014 Turfgrass Research Field Day Guide. The final results were published in the publication of the 5th European Turfgrass Society Conference.

Griffin, B., E. Bauske, and C. Waltz. 2014. Sustainability of turfgrass with soil incorporation of organic matter. 2014 Turfgrass Research Field Day Guide. p. 32-34.

Waltz, C. and E. Bauske. 2016 Improving water use efficiency with soil incorporation of organic matter. 5th European Turfgrass Society Conference. June 5-8. Salgados Portugal. Pages 85-86.

Goal 3: Assess the ‘real’ cost of sustainable turfgrass, organic matter amendments, and WaterSense New Home Certification Program to turfgrass consumers.

Outcome: We have explored the factors involved in the WaterSense New Home Certification Program and assessed their economic impact.

- All indoor water-saving components required by the WaterSense program are now required by State law (as of July 2012) and therefore incur no additional expense to the builder. Impact \$0
- DeKalb, Fulton, Clayton, Gwinnett, and Cobb counties did not provide any builder incentives to defer any increased costs associated with this program. Impact \$0.
- Previously reported studies (2nd Annual Report: Product Development: Phase II Sustainable Turfgrass and Water Conservation) indicate that WaterSense irrigation

contractors do not charge more than other contractors and there are no additional costs associated with outdoor sprinkler systems specified by the WaterSense program. Impact = \$0.

- The WaterSense labeled irrigation controllers (weather-based or soil moisture sensor-based) required for use on a WaterSense home may be slightly more expensive than a simple controller. However, the cost difference is so small it could not be detected in contractor pricing. Impact=\$0.

Only three additional costs can be identified:

- The cost of the inspection to verify that the home meets the requirements of a WaterSense home. At this time there is no significant support for this program and pricing information was not found.
- Potential cost of additional organic matter when planting sod. The price of the organic amendments used in this study was highly variable, depending on distance from the source and the quantity purchased.
- The price of irrigation water saved. The price of water in Georgia is highly variable, depending on location.

Given the factors above (status of the WaterSense New Home Construction program and variable amendment and water costs) it is not possible to develop an applied model with meaningful application.

Beneficiaries

- 2,328 Landscape workers were trained in techniques to create sustainable turfgrass with an average of 30% improvement from pre- to post-training knowledge evaluations
- 488 Middle managers/practitioners learned about the potential water conservation benefits of organic amendments
- 70 County Extension agents each received 6.5 hours of sustainable turfgrass training
- Homeowners now have resources to help them choose irrigation professionals using water-conserving systems that help create sustainable turfgrass

The project positively impacted homebuilders, commercial property owners, managers, and homeowners. This project integrated research results of field tests, greenhouse tests, and economic analysis into the educational process and addressed water conservation issues that have negatively impacted turfgrass sales in recent years. This was the final phase of this project. This phase focused on completing the training and research components of the project.

Lessons Learned

Our educational efforts were very successful. We were able to reach landscape and turfgrass workers, their supervisors, and county Extension agents. By carefully choosing training venues and targeting the message to the audience, we were able to create popular and useful trainings. For workers, that often meant making repeated visits to the workplace to present each of the half-hour trainings (Turfgrass Identification, Turfgrass Maintenance, Turfgrass Irrigation, and Turfgrass Installation). For middle management, that meant meeting them in the field, and Extension Educators were trained by incorporating sustainable turfgrass information into already existing Extension education sessions held at field days and workshops.

We did not anticipate the extent of the housing market collapse when this project was proposed. Nor did we realize that the WaterSense New Home Construction program would lose support. Indoor components of it were incorporated into state law. Outdoor components of the program decreased substantially as the number of new homes dwindled and urban green industries struggled to survive. Homeowners were made complacent by several years of regular and abundant precipitation, pushing water issues to the back burner and eroding political support for water conservation. The components of the model we had hoped to generate disappeared one by one. Though we were able to create two years of valuable field data, relatively wet weather and timely precipitation events in 2015 resulted in no usable data that year.

Contact Person

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Additional Information

None

17). Vidalia Onion Committee- Sweet Vidalia Flavors of Summer - Final Performance Report

Project Summary

The Vidalia Onion Committee (VOC) continued a promotional campaign in 2014 entitled “Sweet Vidalia Flavors of Summer.” The objective of this effort was to promote the versatility and benefits of Vidalia Onions to a younger consumer demographic. In order to reach Millennials and Generation X consumers, the VOC implemented more social media activities using

Facebook as well as Instagram, Twitter and Pinterest. This included outreach to food bloggers who participated in a Vidalia onion field tour to launch the 2014 season. In addition, a co-op partnership with Applebees restaurants showcased Vidalia onions as the featured menu item with a national television commercial and local media activities in the state of Georgia.

Retailer activities included point-of-sale materials, high-graphic bag packaging, a newly improved retailer section of the VOC's web site, and a monthly crop report which included marketing and merchandising information.

The campaign was well received among consumers with a 62% increase in Facebook followers (57,300 page likes) and a 30% increase in website visitors during the campaign. Our food blogger outreach resulted in more than 60 blog posts and these, combined with their social media posts, reached over 6 million consumers nationwide. The new retailer section of the VOC's web site resulted in 4,690 unique visitors during the campaign. Large retailer chains responded to the monthly crop report by opening the report and/or clicking through to the web site and this included Wal-Mart, Kroger, Target, Albertsons and more.

Project Approach

For the past several years, the Vidalia Onion Committee has invested a large majority of its marketing budget on traditional public relations activities and on co-op promotions with established consumer brands. Those efforts had been successful in increasing consumer awareness but there was a concern that the focus had been to highlight the brand partnership rather than educate consumers on the benefits of Vidalia onions.

Research revealed that consumers aged 56 or older had been steadily increasing their purchase of Vidalia onions (11% increase since 2006 have purchased Vidalia Onions in the past year). Traditional public relations efforts had impacted this consumer age group the most. But consumer research also revealed that only 8% of consumers age 18-25 had purchased Vidalia Onions in the past year and this has declined by several percentage points since 2006 with consumers age 26-45.

Millennials are the largest generation since the Baby Boomers, making up 24% of the population with 77 million consumers. These digital natives are the "social generation" with 75% having created a profile on a social networking site (Pew Research). Whether it's online or via mobile, they prefer to be constantly connected to their social circles. In addition, Generation X consumers are also heavy users of social media and 67% obtain their news via their computer versus the newspaper.

Since traditional PR activities were not as effective in reaching these two key consumer audiences, the VOC decided to become more strategic with its marketing tactics and invest more funds in digital and social media activities. A new, hip, and energetic campaign theme and

image was created to reach this younger demographic and introduce them to the benefits and versatility of Vidalia onions. This is planned to become a long-term program for the next 3-5 years.

The program ran throughout the state of Georgia and nationwide. VOC can provide copies of all marketing materials as requested, media clippings, ad copy, web screen shots, and other supporting documentation proving sole use was for VO promotion (*available upon request from GDA*).

The Sweet Vidalia Flavors of Summer Campaign included the following marketing tactics:

- Campaign Launch Event with Food Bloggers from the around the U.S.
- Consumer and Trade Print Advertising
- Public relations activities
- Facebook Engagement
 - Digital Coupon*
 - Weekly Give-A-Ways during May and June*
- Weekly Social media outreach on Instagram, Facebook, Twitter and Pinterest
- On pack messaging with high-graphic bags
- National Food blogger recipe contest*
- Foodservice promotion with Applebees restaurant chain*
- Retailer support:
 - Point-of-Sale materials including high-graphic bins, bags and tear-off recipe pads
 - Monthly crop report with campaign and merchandising information
 - National sales data research study on Vidalia onions and the onion category at retail
 - Newly improved retailer section of the VOC's web site

**federal grant dollars were not used to fund these components of the campaign.*

Campaign Launch Event: To celebrate the start of the 2014 season The Vidalia Onion Committee hosted a field tour for food bloggers and media on April 25-27, 2014.

During the weekend event, participants were treated to a wide variety of specially prepared meals from local chefs featuring the versatility and flavor of Vidalia Onions. A total of 11 national food bloggers and key media explored the onion fields and viewed how Vidalias are harvested by hand. A tour of the packing facility showcased how these sweet onions are carefully handled, graded and packaged ensuring quality and food safety. Showcasing the entire farm to fork experience gave these individuals a real sense of not only how and where Vidalia onions are grown but, more importantly, what makes them so special.

The tour luncheon was hosted by Applebees and they introduced and prepared a new menu item that was scheduled to launch in all U.S. restaurants on May 5. The Grilled Vidalia Onion

Sirloin was the result of a partnership between The Vidalia Onion Committee and Applebees restaurant. The participants also attended the Golden Onion professional cooking competition and received a private tour of the Vidalia Onion Museum.

The participants posted live from the farm tour, the weekend tour resulted in 324 social media posts from the food bloggers on Twitter, Facebook, Instagram and Pinterest reaching 5.45 million total consumer impressions. In addition, 7,000 fans followed the tour on the VOC's Facebook page.

From May until August, the bloggers posted 31 articles on their sites reaching an audience of 1.5 million consumers. Each blogger was provided with a \$500 (*not paid for with grant funds*) Visa gift card to post on their blog sites as an online give-a-way. This resulted in 146,000 entries which is the largest consumer audience we have reached with an online give-a-way to date.

'V' Culinary Challenge: The Vidalia Onion Committee engaged food bloggers with the "V Culinary Challenge". Bloggers posted their own unique creations and consumers were invited to peruse the recipes and vote for their favorites. The grand prize winner received a cash prize of \$2,500, and two runner-up winners received a cash prize of \$500 (*not paid for with grant funds*).

Social Media: A variety of social media events were implemented including weekly trivia contest and food blogger recipe contest on the VOC Vidalia Onion Facebook page. We increased our Facebook fan base by 62% to over 57,300 fans. We also saw an increase of 30% in unique visitors to our web site during the campaign and the majority of these were consumers aged 18-34. The VOC also offered a coupon (*not paid for with grant funds*) for \$0.50 off 5 pounds or more of bagged or bulk Vidalia onions. This coupon was obtained via the VOC's Facebook page.

New Retail Section on Web Site: We created a new retailer section on the VOC web site which included onion category research highlights, downloadable campaign graphics, merchandising tips and retailers could sign up to receive our seasonal crop report. Retailers could also request Point of Sale materials from this site.

Goals and Outcomes Achieved

Objective #1 – To sustain or increase the farm gate value of Vidalia Onions. Grow consumer website and social media users by 3% compared to the previous year.

Results:

- Sustained the farm gate value of Vidalia Onions.
- Increased unique visitors to our web site by 30% during the campaign
- Increased Facebook fan base by 62% resulting to over 57,300 fans.
- Purchased consumer advertisements on Facebook reaching 429,000 consumers within our target younger, Millennial consumer demographic

- National Food Blogger Contest was posted on Facebook:
 - 30 bloggers participated and posted recipes on the VOC Facebook page
 - Included 30 blog posts featuring these recipes
 - Contest page – 4,000 visitors
 - First Place Winner – 583 votes
- Increased the VOC's Pinterest followers by 100%
- Increased the VOC's Twitter followers by 30%
- Created a new VOC Instagram page resulting in 1,929 new followers
- Food Bloggers Field Tour Event:
 - 324 social media posts from the food bloggers on Twitter, Facebook, Instagram and Pinterest reaching 5.45 million total consumer impressions. In addition, 7,000 fans followed the tour on the VOC's Facebook page.
 - Food bloggers posted 31 articles on their sites reaching an audience of 1.5 million consumers

Objective #2 – Reach a younger consumer demographic with Millennial and Generation X consumers

Results:

- 47% of the VOC's Facebook fans reached were age 18 – 44 and they were the most engaged with likes, shares and posts.
- VOC's web site statistics of consumers visiting the web site during the campaign:
 - 76.5% of web site visitors were within our target age group of 18 - 44
 - 27.50% were age 18–24
 - 33.50% were age 25-34
 - 15.50% were age 35-44

Objective #3 – Provide more information and resources for supermarket retailers

Results:

- Created a new Retailer section on the VOC's web site that included campaign information, highlights from the national sales data research and merchandising tips
- New retailer section of the web site had 4,690 unique visitors during the campaign
- The monthly crop report was delivered in an e-newsletter to over 450 supermarket retail produce buyers, directors and VP's

These retailers opened the report and/or clicked through to the web site:

Wal Mart	Save Mart	AWG
Kroger	Save-A-Lot	HEB
Albertsons	Meijer	Ralphs
Costco	Stater Bros	Stop n Shop
Target	King Soopers	The Fresh Market
Ahold	Giant Eagle	Rouses
Price Chopper	Food City	Winn Dixie
Wakefern	Ralphs	King Soopers
Wegmans	Dahls Foods	Schnucks
Hy Vee	Food City	Haggen Foods
Homeland Stores	BJ's Wholesale Club	Supervalu

Additional Results:

Applebees Cross Promotion

- Vidalia Featured menu item – Grilled Vidalia Onion Sirloin: Reached 1 million guests per day for 6 weeks
- National television advertising: \$8 million spent resulting in 1.1 million impressions with adults 18-49
- Significant digital exposure. 5M Facebook fans on the Applebees brand page and over 1M local (restaurant) page fans
- Plate sales included a total of 1.6 million Vidalia Sirloins during the campaign timeframe.

The campaign ran from May 5 – August 17, with “Take 2” (the 4 oz. version of the steak) running from June 30 – August 17.

(Please note that Specialty Crop Block Grant Funds were not used in the Applebees promotion, but this campaign did extend our ability to reach our targeted consumer audience.)

Beneficiaries

This project impacted approximately 100 growers and packers of Vidalia® onions by providing an efficient, enticing, customer-friendly, integrated retail and consumer marketing program to promote their product. It impacted the state, as Vidalia® onions are the official state vegetable of Georgia and Vidalia onions bring in roughly \$140-million farm gate value to the state's economy annually, which VOC would like to increase through these marketing initiatives. The state of Georgia and its residents benefited from tourism and related revenue streams from Vidalia onions retaining their popularity.

Retail customers were able to utilize the bag packaging and point-of-sale materials to educate shoppers in-store on the benefits of Vidalia Onions. In addition, we provided additional tools and resources for retailers to assist them in developing impactful merchandising displays. This included a newly improved retail resources section of the Vidalia Onion Committee web site and a monthly e-newsletter that included a crop report and merchandising tips.

Vidalia consumers were positively affected, as they better understood the advantages of Vidalia onions and were more likely to purchase Vidalia onions.

Lessons Learned

The Sweet Vidalia Flavors of Summer promotion was a cost-effective way to maximize our marketing dollars and educate a younger demographic on the versatility and taste benefits of the Vidalia onion. The campaign provided tools, tips and educational information in a visible, appealing manner, and is in line with our continued goals and efforts to increase sales and consumer awareness. Going forward, we will continue to increase our spending on Facebook advertising as it appears to be a very effective mode of communicative advertising.

Contact Person

Susan A. Waters, 912-537-1918

Additional Information

None

18). Vineyard and Winery Assoc. of West Georgia - Vineyard and Winery Initiative for West Georgia -Final Performance Report

Project Summary

The Vineyard and Winery Initiative for West Georgia (VVAWG) seeks to re-establish the wine-grape industry that thrived here at the end of the 19th Century before Prohibition. Wine-grapes offer the region a sustainable agriculture practice that is environmentally friendly and produces a value-added commodity, the wine-grape, and all of its potential by-products. Further economic benefits to the region and the state as a whole include the development of agritourism, as the vineyards and wineries have potential to draw visitors to the region. The sustainability of the wine-grape adds value to agricultural land and enable farmers to continue working while the region remains green, instead of the land ultimately being flipped to build residential subdivisions. VVAWG obtained grant funds to further educate the association members as to wine-grapes and co-operatives, develop a business plan for a wine-grape co-operative and conduct DNA testing of the disease resistant grapes, all vital activities that will ensure the success of the initiative.

The Vineyard and Winery Association of West Georgia's goal was to educate novice grape growers step by step, from vineyard site selection all the way to wine marketing strategies.

The wine-grape industry's value is multiplied further out by the potential it has for tourism. Wine tours will attract visitors from across the southeast and beyond to the region, allowing them the opportunity to visit various vineyards and wineries, as well as the count's many other historical and cultural attractions.

The varieties of grapes being planted have thus far proved to be highly disease resistant which means that the growers will not have to spend copious amounts of time and money spraying the grapes with potentially harmful pesticides and herbicides.

For the purpose of this grant, a further objectives was to increase the knowledge base of the local association by bringing in experts on wine-grapes, wine making and co-operatives to meet with (and train) the local group, ultimately resulting in more growers due to an increase in interest in the wine-grape industry.

Project Approach

The Vineyard and Winery Initiative for West Georgia (VVAWG) seeks to re-establish the wine-grape industry that thrived here at the end of the 19th Century before Prohibition. Wine-grapes offer the region a sustainable agriculture practice that is environmentally friendly and produces a value-added commodity, the wine-grape, and all of its potential by-products. Further economic benefits to the region and the state as a whole include the development of agritourism, as the vineyards and wineries have potential to draw visitors to the region. The sustainability of the wine-grape adds value to agricultural land and enable farmers to continue

working while the region remains green, instead of the land ultimately being flipped to build residential subdivisions. VWAWG obtained grant funds in 2013 to further educate the association members as to wine-grapes and co-operatives, both vital activities that will ensure the success of the initiative.

For the purpose of this 2013 grant, the primary objective was to increase the knowledge base of the local association by bringing in experts on wine-grapes, wine making and co-operatives to meet with (and train) the local group, ultimately resulting in more growers due to an increase in interest in the wine-grape industry. The Vineyard and Winery Association of West Georgia's goal was to educate novice grape growers step by step, from vineyard site selection all the way to wine marketing strategies.

Activities Performed

The Vineyard and Winery Association of West Georgia had a very busy schedule of activities from during the 2013 grant period (Sept. 2013 to Sept. 2016). All were in keeping with our mission of Agriculture Education not only for potential vineyard owners, but also for the general public to build up interest in Georgia Grown fruit and wines.

Project Activity	Who	Completed
Kick-off Vineyard and Winery Grant, execute contracts	Vineyard and Winery Association Board	October 2013
Procure consultant for wine-grapes	Vineyard and Winery Association Board	November 2013
Procure consultant for co-operatives	Vineyard and Winery Association Board	November 2013
Conduct three field days, a symposium, three workshops and two bus tours	Wine-grape Consultant Co-operative Consultant	December 2013 – September 30, 2016
Conduct pre- and post- surveys of workshops and share results with consultants	Vineyard and Winery Association Board	December 2013 – September 30, 2016
Submit annual report	Vineyard and Winery Association Board	October 2014, 2015

Submit final close-out report	Vineyard and Winery Association Board	November 2016

Goals and Outcomes Achieved:

Goal	Performance Measure	Benchmark	Target
To increase the knowledge and leadership base of the participants in the Vineyard and Winery Initiative as it relates to wine-grapes	Increased knowledge measured by post-workshop survey results	Pre-workshop survey results	70% or greater increase in knowledge by workshop participants
<p>The Vineyard and Winery Association of West Georgia held over 40 events from 2013-2016 with an educational component to teach members of the VWAWG about wine-making. Surveys were utilized after each Symposium to determine the level of interest and knowledge of the association.</p> <p style="text-align: center;">2014</p> <p>The Association held over 20 events in 2013-2014 (<i>full list available upon request from GDA</i>). Surveys were utilized at the 2014 Symposium to determine the level of interest and knowledge of the attendees to see if the program was still continuing to successfully educate and engage its membership. For knowledge, all but two participants surveyed, 89% of total, reported an increase in their wine-making knowledge based pre-symposium to post-symposium with the average score increasing from 2.74 (a little/some) to 3.89 (a lot). Participants reported an increase in interest (94%), that they would attend future workshops (100%) and that they would recommend the Vineyard and Winery Association of West Georgia to others (100%). Overall satisfaction of the workshop was measured at 3.5, with mostly good and excellent</p>			

responses. The presenters also received high marks, with attendees valuing the experts available. The materials and venue received the lowest marks with a number of fair responses and should be considered for improvement.

2015

Surveys were utilized at the 2015 Symposium to determine the level of interest and knowledge of the attendees to see if the program and education offered were continuing to successfully educate and engage the membership. For knowledge, all participants surveyed, 100% of total, reported an increase in their knowledge based pre-symposium to post-symposium with the average score increasing from 2.74 (a little/some) to 3.89 (a lot). Participants reported an increase in interest (86%), that they would attend future workshops (100%) and that they would recommend the VWAWG to others (100%). The presenters also received high marks, with attendees valuing the experts available. The materials and venue received the lowest marks with a number of fair responses and should be considered for improvement. This year we received greater input to provide more information for production and business model for commercial production.

2016

Post symposium surveys revealed that knowledge increased from 57% with some knowledge to 65% with a lot of knowledge. Interest had increased by 100% of the participants. 57% of symposium participants considered themselves wine-grape growers, and 65% intended to grow grapes in the future. All of the participants planned on attending future workshops. Symposium attendees were particularly enthusiastic about the panel of wine-grape experts who presented the program.

Goal	Performance Measure	Benchmark	Target
To increase the knowledge and leadership base of the participants in the Vineyard and Winery Initiative as it relates to co-operatives	Increased knowledge measured by post-workshop survey results	Pre-workshop survey results	70% or greater increase in knowledge of cooperatives by workshop participants

In the past, the VWAWG board hosted a co-operative expert from Maryland (2012) and is still considering the cooperative as a model for the area. At the symposium, members expressed interest in looking at business models for commercial production, and this will be explored in more detail in 2016. The feedback received is that the growers are now knowledgeable about growing grapes. Now they want to move into the business portion and answer the question as to how to make this industry work in Western Georgia.

With a well-established farm winery and a number of grape growers in the area, a small network of local wineries may be more feasible at this point than a co-operative winery.

Beneficiaries

The direct beneficiaries of this grant project are the grape-growing members of the association as well as those with an interest in growing grapes. At every symposium and workshop, the attendees noted an increase in knowledge and interest in wine-grapes and the winery business. To re-establish that specialty crop to the region would have a tremendous impact, not only directly in making farm land sustainable but also indirectly in promoting tourism spending across the region.

Lessons Learned:

The education of growers has proven to be beneficial to the establishment of the wine-grape as a specialty crop in the region. Interest in the crop continues to grow. This year, 2016, grapes continue to be harvested in Carroll for the production of wine. With a local winery in production and a number of farmers growing grapes, a co-operative winery may no longer be the best solution for Carroll County. Current trends are instead for a network of farm wineries and wine-related businesses in the area.

Each vineyard and/or winery has offered and provided many times one-on-one time to new growers, answering questions by phone and in person when someone comes in wanting advice. Our network of information continues to expand daily. We get ideas for future presentations from our members all the time. It's amazing at the questions they still have and the questions that we're now able to answer with help from our growing experts.

We will continue education for growers, winemakers and the public through workshops such as pruning, harvest lessons panel discussions, presentations from experts through our Symposium and in individual opportunities. Our Association will continue to work with Paula Burke on sharing information from our 2015 grant Evaluation of Novel Disease-Resistant Winegrape

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Additional Information

none